Master's Dissertation in Engineering

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

휘발유 보조금 폐지가 나이지리아 경제적 성과에 미치는 영향에

대한 계량 경제 분석

February 2014

Graduate School of Seoul National University

College of Engineering

Technology Management, Economics and Policy Program

Hamza Aliyu Daneji

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

지도교수 김태유

이 논문을 공학석사학위 논문으로 제출함

2014 년 02 월

서울대학교 대학원

협동과정 기술경영경제정책전공

Hamza Aliyu Daneji

함자 알리유 다네지의 석사학위 논문을 인준함

2014 년 02 월

위 원 장 ___김연배___(인)

부위원장___김태유___(인)

위 원 ___이현정___(인)

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

지도교수 김태유

이 논문을 공학석사학위 논문으로 제출함

2014 년 02 월

서울대학교 대학원

협동과정 기술경영경제정책전공

Hamza Aliyu Daneji

함자 알리유 다네지 의 석사학위 논문을 인준함

2014 년 02 월

위 원 장 _____(인)

부위원장 _____(인)

위 원 _____(인)

Abstract

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

Hamza Aliyu Daneji

Technology Management and Policy Program

College of Engineering

Seoul National University

Nigeria is one of the world's crude-oil-exporting countries (OPEC member) with light/sweet crude oil properties and a high volume of production (about 2.5 MMbbls/day).[1] Oil is the major contributor to the national economic growth. Nigeria has a population of about 170.1 million and is one of the most extensive countries in terms of areal size in Africa. It also consists of two major regions: North and South. The southern coastal region is the domicile of Nigeria's oil production and export terminals as well as its refined-product receiving terminals. Although Nigeria produces oil, its domestic refining capacity is by far lower than its domestic demand.[2] As a consequence, refined

[1] http://www.nnpcgroup.com/NNPCBusiness/UpstreamVentures/OilProduction.aspx

[2] Over 98% of the oil produced in 2009 was exported as Nigeria does not have the capacity to refine most of its crude oil (International Energy Agency [IEA], 2010).

petrol has to be imported to bridge the shortfall in the domestic supply.

Consequently, to ensure the uniform pump price of petrol across the country, the federal government subsidized the cost of the transport of petrol from the southern source area to the northern high-demand areas. The government also pays the cost differential of imported petrol to marketing companies because the landing cost is higher than the regulated pump price.

Along with the rapid increase in crude oil quality differentials also emerged a widening gap between the prices of light and heavy products.[3] The forgone revenue estimates in oil-exporting countries approximate one-third of all the oil export revenues (Cosmo, 1989). Thus, with the continuous rise in energy prices, the subsidies provided by the government will become even more costly and increasingly difficult to remove.

Oil, the main backbone of the Nigerian economy and one of the most valuable, versatile, and flexible non-reproductive, depletable natural resources:

- constituted 97% of Nigeria's foreign exchange earnings since the 80s; and
- accounted for just above 20-25% of the total GDP in the 1980s, and 70% of the budgetary revenue.

Oil subsidy exists when consumers would pay the market price per litre of petroleum product, less than the actual price. From September 1986, the

[3] According to Hossein Tahmassebi (May 1985), the difference between the spot prices for Middle Eastern heavy crude oil with an API gravity of 31°, and African light crude oil (37-40° API), which averaged only USD0.98 per barrel in 1972, jumped to USD2.67/b in 1974. The increase was even more pronounced during the 1979 crisis, when the gap widened from USD1.75/b in 1978 to USD5.03/b in the following year.

government decided to gradually withdraw its subsidy on petroleum products. Notwithstanding this situation, majority of the Nigerians continue to clamor for further subsidy removal in the downstream oil sector of the Nigerian economy. This research aimed to analyse the impact of petrol subsidy removal on the economic performance of Nigeria, and to determine if the petrol consumption (demand) affects the national income (GDP).

The analysis was conducted using the multiple regression econometric approach, with income being a function of the domestic pump price of petrol as well as petrol subsidy and consumption, which indicates that an increase in the consumption of petrol positively impacts economic growth, generating additional oil revenues that can be used to boost economic development. A further research was conducted using time series analysis to observe the effects of the variables over time.

Economic performance can also be enhanced through policy comparisons with other oil-producing developing countries that successfully adapted the full subsidy withdrawal scheme. Policies based on the further development of abundant alternative energy resources will broaden their availability and will boost the economic development. It will also minimize energy wastage and carbon emissions due to the availability of cheap oil, and will save enough oil to meet the future increases in the oil demand.

Keywords: ***Nigeria, petrol subsidy, econometric analysis, time series analysis, impacts, economic performance***

Student ID: 2012-22604

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations

CBN	Central Bank of Nigeria
IOC	International oil company
NNPC	Nigerian National Petroleum Corporation
OPEC	Organization of Petroleum-exporting Countries
PPPRA	Petroleum Product Pricing and Regulatory Agency
SAP	Structural Adjustment Programme
DPR	Department of Petroleum Resources
PMS	Premium motor spirit
NEITI	Nigerian Extractive Industries Transparency Initiative
NGC	Nigerian Gas Company
PEF	Petroleum Equalization Fund
GDP	Gross domestic product
OMC	Oil marketing company
OTC	Oil trading company
FOREX	Foreign exchange
NEC	National Energy Commission
ENAP	Empresa Nacional del Petroleo
DPK	Dual-purpose kerosene
AGO	Automotive gas oil

Chapter 1: Introduction

1.1 Background

Fossil fuel energy is the major tool for Nigeria's economic growth and development. It plays an important role in the nation's diplomacy and as a tradable commodity for income generation, to support the economic development. Nigeria is richly blessed with primary energy resources, endowed with the world's tenth largest reserves of crude oil, which is currently estimated to be about 36 billion barrels[4] (about 4.896 billion tons of oil equivalent in 2006). Globally, apart from its being the 14th largest producer of crude oil (index mundi) and having the 10th largest proven crude oil reserves, Nigeria also possesses the 8th largest proven reserves of natural gas.

According to Oyedepo (2012), energy, specifically oil and gas, continues to contribute over 70% of Nigeria's federal revenue for its national development programs, and crude oil has contributed an average of 25% to Nigeria's gross domestic product (GDP), the second highest contributor after crop production. As of 2005, the energy mix is dominated by oil, which accounts for about 57%, followed by natural gas (36%) and hydroelectricity (7%). The major driver of energy demand is the population, and the energy demand is determined by the level of economic activity and measured by GDP (Sambo et al., 2006).

There are four refineries with an installed capacity of 445,000 barrels of

[4] Oyedepo, 2012, pp. 2584-2587.

fuel per day. The country's industrial base is relatively low compared to the demand for fuel driven mainly by domestic consumption and transportation. The predominant determinants of the Nigerian energy consumption mix are petrol, kerosene, and diesel oil, with small amounts of other refined products being exported occasionally from the domestic refineries. Nigeria's daily energy consumption is considered low (109.5 kWh) relative to the proportional consumption of petrol fuel per 1,000 persons. This is indicated in Table 1.

Table 1: Petrol Consumption and GDP in Some Selected Countries

Country	Daily Energy Consumption (kWh/1000 persons)	Daily Petroleum Fuel Consumption ('000 barrels)	Petroleum Fuel Consumption (bbls/1000 persons)	GDP 2006 (USD billions)	Annual GDP Growth Rate % (2005)	Average Annual Growth (1990-2001)
Egypt	1276	538	7.61	107.18	4.96	4.5
Indo-nesia	496	1022	4.42	364.4	5.6	3.8
India	460	2000	1.91	906.26	9.23	5.9
S. Africa	5487	482	11.04	254.9	4.87	2.1
Nigeria	109.5	257	1.98	114.68	6.94	2.5
Ghana	301	31	1.53	12.9	5.9	4.2
Brazil	2006	2200	12.50	1067.96	2.3	2.8

Source: National Technical Working Group on the Energy Sector, Vision 2020 Report, 2009.

The total primary energy consumed in 2007 was 11.4 million tons of oil equivalent (MMTOE), with petroleum products having the greatest share (67.3%) of the total consumption, amounting to an average of 78.7% between 2002 and 2007 (Oyedepo, 2012).

As Nigeria is a net importer of fuel products (about 80%), the domestic consumers are subjected to price regimes in the international markets. The fuel supply is monopolized by NNPC and its subsidiaries. NNPC acts as the

regulator, distributor, competitor, and producer in the retail markets by licensing importers and distributors, fixing the local pump pricing, owning fuel stations and depots, and also administering the subsidy payments to the distributors. This led the Nigerian energy market to be classified as a regulated monopoly with a regulator, and also a competitor, in the energy market.

Fuel is considered an inelastic product from both the demand and supply sides, signifying that it is difficult for the consumers to find alternatives to the use of petrol, kerosene, or diesel due to the non-existence of electric train systems, solar heating, and cooking appliances. Also cooking gas is supplied in cylinders (lack of fully networked domestic gas distribution network), making it unaffordable to the poor, who make up 70% of the whole population.

The government adopted various economic measures[5] between 1982 and 1986, including the Economic Stabilization Act of 1982, the National Economic Emergency Act of 1985, and the Structural Adjustment Programme (SAP) of 1985, all aimed at long-term sustainable economic growth and development. The SAP was the most comprehensive reform programme in terms of scope, with four principal aims: trade liberalization, deregulation of the financial sector, rationalization and privatization of public sector enterprises, and adoption of appropriate pricing policies (by eliminating subsidies especially from petroleum products and public enterprises).

[5] G. Ugo Nwokeji, The Nigerian National Petroleum Corporation and the Development of the Nigerian Oil and Gas Industry: History, Strategies, and Current Directions, 2007, p. 14.

Deregulation of the Petroleum Industry

One of the pillars of the Transformation Agenda of the Federal Government is the progressive deregulation of the petroleum industry. In January 2012, the decision to remove the subsidy on premium motor spirit (PMS) or basically petrol was announced by the government, citing a number of major reasons for the need to institute the policy.[6]

First, the subsidy regime, in which fixed prices are maintained irrespective of the market realities, has resulted in a huge unsustainable subsidy burden and also the inability to make an impact on the intended beneficiaries. The subsidy level is directly correlated with the household income as richer households consume larger quantities of petroleum products. Consequently, the subsidy benefits mostly the rich. Another major challenge is that the subsidy administration is beset with inefficiencies, leakages, and corruption (both within the government and by the other stakeholders involved).

Petrol subsidy has resulted in the diversion of the scarce public resources from investment in critical infrastructure while putting pressure on the government resources. There is discouragement in terms of competition and stifled private investment in the downstream sector due to the low fund generation from the cheap price of petrol for the consumers. Due to the

[6] Adopted from Subsidy Reinvestment and Empowerment Programme (SURE-P), 2013.

absence of deregulation, investors have shied away from investing in the development of refineries, petrochemicals, fertilizer plants, etc. It is important to note that since the year 2000, the government has issued 20 licenses for new refineries, none of which has resulted in the construction of a new refinery.

The deregulation of the downstream sector of the petroleum industry will lead to rapid private sector investment in refineries and petrochemicals, which will generate millions of jobs and will lead to increased prosperity on the part of the people. The huge price disparity has encouraged the smuggling of petroleum products across the borders to the neighbouring countries, where the prices are much higher. Nigeria therefore ends up subsidizing the consumption of petroleum products in its neighbouring countries.

The government has, over the years (since 1986), progressed from the gradual lifting of the subsidy on petroleum products to the appropriate pricing stage, resulting in increases in pump prices, which greatly impact[7] the political economy of Nigeria.

The inability of the Nigerian industry to refine its crude oil has given rise to inefficiency due to the corporations' continuous selling of unrefined crude oil from the federal allocation in the international market since the 1980s, and due to the use of the proceeds to import refined petroleum products. According to the results of the NEITI audit in 2006, the domestic demand for

[7] Subsidy withdrawal may have both positive and negative consequences on the political economy.

PMS has risen so much that the existing refineries cannot meet it even if they produce at full capacity.

The Petroleum Product Pricing Regulatory Agency (PPPRA) came into being in August 2000 as an entity set up by the government to look into the downstream petroleum sector, which is characterized by the problems of scarcity of petroleum products leading to long queues at the various stations, low-capacity utilization and refining activities at the nation's refineries (poor state of refineries), rampant fire accidents as a result of the mishandling of products, product adulteration, pipeline vandalisation, large-scale smuggling due to unfavourable economic-product border prices for the neighbouring countries, and also to tackle the challenge of low investment opportunities in the sector.

Among the recommendations accepted by the government is the immediate setting up of PPPRA as an agency with sufficient autonomy to supervise the various phases of the proposal embodied in the report, especially the liberalization of the downstream sector of the petroleum industry.

1.1.1 Objectives of subsidy reform in Nigeria

The Nigerian government stated that its Medium-Term Fiscal Framework cannot work unless the fuel subsidy is scrapped, because the government needs N1.3 trillion savings for its critical infrastructure development projects.[8]

[8] Iyobhebhe, J. (2011). Removal of Fuel Subsidy in Nigeria: Issues and Challenges.

The removal will thus generate short-term pain due to the inflationary measures taken, but there may be much more long-term benefits as the market will self-regulate and the petroleum product prices will settle at the natural global market price. This will bring about more investment opportunities and an advantage for the commissioning of more private refineries.

The main reasons behind the fuel subsidy removal in Nigeria are as follows: to encourage foreign direct investment in the oil sector; to provide employment for the citizens; to improve education, health, power, water resources, and agriculture (Nwadibo, 2012); to boost the local refinery production; to reduce in the medium- and long-term importation of refined products; to gain more funds for local investment in the local sector; to help address the great imbalance between the recurrent and capital expenditure in Nigeria (Iyobhebhe, 2011); and to allow the government to gain access to more funds for public infrastructure development (Iba, 2012).

Many countries provide subsidies to some sectors (e.g., transport and agriculture) to enhance the economic activity and to curb inflation. Thus, the subsidy provision shields certain sectors from oil price increases (as a result, the demand in these countries failed to respond to the higher prices). In the countries with no subsidies, the demand for crude oil became stagnant or fell as the global crude oil prices climbed from 2007 to 2008. For the countries with subsidies, however, the demand was largely unresponsive to the price changes (as these political decisions maintained the artificiality of high demand). BP estimates that the countries with subsidies accounted for 96% of

the world's increase in oil consumption in 2007.

The effect of subsidy reform will vary depending on the reform process employed. Sudden price fluctuations tend to have the greatest impact on the low-income consumer groups. Price hikes will also translate into higher business input costs, with effects on sales, and eventually, profits. On the other hand, instituting a reform will result in financial savings, which can be used to support the negative effects of the reform on the consumers and businesses, redirecting savings into social welfare programs and other economic activities. For as long as the financial benefits are used to promote the consumers' and businesses' satisfaction, the resulting social impacts could be positive[9] (in achieving better socioeconomic outcomes than the subsidy regime).

1.1.2 Petrol pricing policy

The expected open market price (EOMP) is calculated as the sum of the landing costs (all the costs incurred until product purchase, including the production in foreign refineries, shipping, and port charges), the cost of distribution in Nigeria, and the various actors' profit margins, plus taxes (see Figure 1). As the government does not impose taxes on petrol, however, the current EOMP prices do not have any tax component. The government-approved retail price is set by the president, and there are no clear indices

[9] IISD, 2012.

determining such prices. The EOMP minus the government-approved retail price signifies the subsidy being funded by the government in the form of under- or over-the-cost recovery. The prices are not changed at fixed periods but are determined at different times by the president. Price increases are usually stiffly opposed by labour unions and citizens, often leading to compromises and lower price increases.

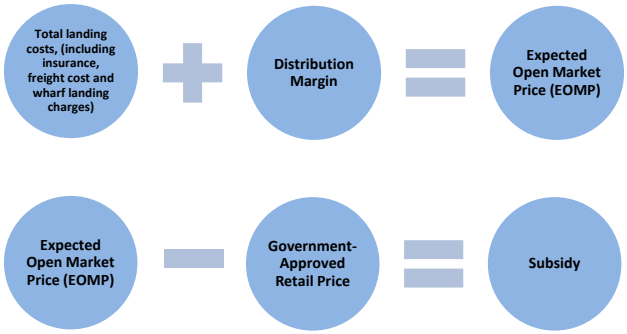


Figure 1: Components of PMS pricing and subsidy per litre.
Source: PPPRA Pricing Template for PMS, 2012.

1.1.3 Types of fossil fuel subsidies

Subsidy, as defined by the Organization for Economic Co-operation and Development (OECD, 2005), is "a result of a government action that confers an advantage on the consumers or producers to supplement their income or lower their costs." There are two main forms of subsidies[10]: (i) subsidies designed to reduce the cost of consuming fossil fuels; and (ii) subsidies aimed at supporting domestic fossil fuel production.

[10] Burniaux et al., 2009.

The consumers' subsidy is mainly intended to keep the fossil fuel prices low so as to stimulate certain sectors of the economy and to alleviate poverty by expanding the population's access to energy (Saunders & Schneider, 2000; Morgan, 2007). This is the main subsidy that is mostly used in non-OECD, former Eastern bloc, and developing countries. It takes the form of price control (IEA, 2007) and involves large price gaps mainly to subsidize transport fuel.[11]

Subsidies aimed at the producers are generally employed to keep the costs of production lower or to increase the revenues, and their effect is keeping the producers in business. These subsidies can also be motivated by the desire to reduce import dependency (European Environment Agency [EEA], 2004). The production subsidies are more common in developed countries than in developing countries.

1.1.4 Economic impacts of subsidy reforms

The outcomes of several global and single-country economic modelling studies on subsidy reforms suggested that on an aggregate level, the changes in the GDP are likely to be positive (Von Moltke et al., 2004). This is due to the incentives that resulted from the price changes, leading to more efficient resource allocation. This is evident in Figure 2, which shows similar petrol subsidy and GDP trends from 2007 to 2010 for Nigeria. The direct relationship means that the increase in subsidy (equivalent to more fund

[11] IEA, 2007.

allocation by the government to support price increase) positively influences the GDP. Thus, there is a possibility of economic development through greater consumption due to the lower price, although this has to be further investigated.

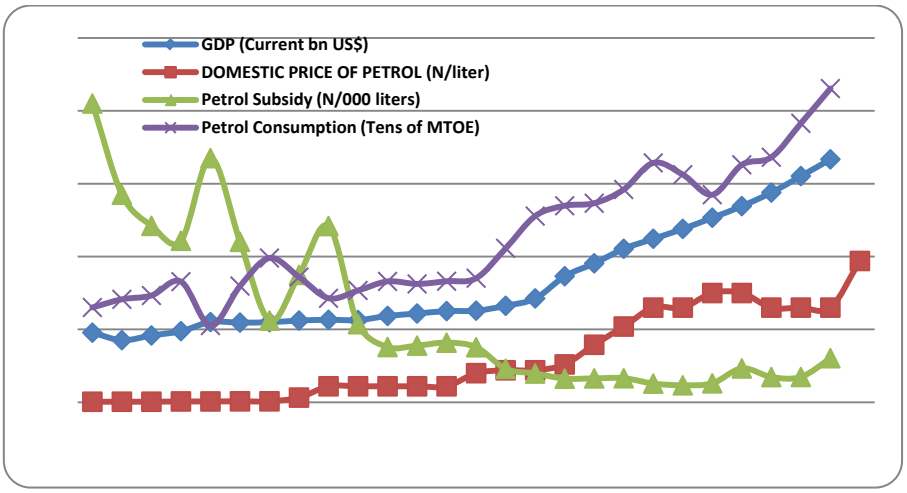


Figure 2: Domestic petrol price and consumption trends.
Source: PPPRA Nigeria and Min. of Petroleum Resources, 2013.

There exist terms of trade effects as resources are deployed productively across countries. “Terms of trade” refers to the ratio of the price that a country receives for its exports to the price that it pays for its imports, expressed in percentages. Improvement in the terms of trade of a country improves its social welfare. Removing taxes in oil-importing countries implies a terms-of-trade gain that comes as part of the gain from the subsidy reform. Oil-producing countries record terms-of-trade gains from removing taxes in

OECD countries, and large terms-of-trade losses from removing subsidies.[12] In addition, Burniaux et al. (1992) noted interesting but temporary terms-of-trade losses in oil-producing countries from delaying the depletion of reserves.

Eliminating subsidies also lowers the government expenditure as it is assumed by some studies that the government savings will be translated into improved social programs. It is also assumed that the economic gains from subsidy reform will be higher in non-OECD countries (Von Moltke et al., 2004).

The prices of petroleum products are uniform and controlled by the government (with frequent adjustments). The petrol price in Nigeria was N65/litre between August 2005 (USD0.50) and December 2011 (USD0.41), except in 2007 and 2008, when it was raised to N75/litre for a month and then lowered to N70/litre. On January 1, 2012, the Nigerian government removed the petrol subsidy and allowed the price to rise above N140 (USD0.88)/litre, but due to the widespread protests, it was lowered to N97 (USD0.61)/litre (representing a 49% increase from the price in 2011). On the other hand, the diesel prices have been deregulated for several years. The price of kerosene was made about one-third of the market price (highly subsidized) to help the majority poor households with their lighting and cooking demands.

Table 2 indicates the cost components that are added to the EOMP of petrol and the subsequent funding as subsidy support by the government in the form of under- or over-the-cost recovery (to bring the cost down to the level

[12] Ellis, J., 2010.

of the local pump price).

Table 2: Components of Petrol Price per Litre

Cost Element	USD/MT	Naira/Litre	
Landing cost	1,059.90	125.6	Actual importation cost of petrol
Distribution margins	130.72	15.49	Costs due to the retailers, transporters, and dealers
EOMP (1+2)	1190.62	141.09	Actual selling price without subsidy
Under/overrecovery	(372.07)	(44.09)	Government's subsidy to bridge the pricing to local sales
Retail price (3+4)	818.55	97	Domestic pump price of petrol

Source: PPPRA Nigeria, 2013

The domestic price of petrol has been increased over time by successive governments, as shown in Table 3; this is to bridge the high margin with the international price. These increases in the pump price per litre of petrol are automatic due to the gradual removal of subsidy funds, aimed at reducing the government's budgetary expenses, which becomes highly unsustainable. Nevertheless, the domestic petrol price in Nigeria is the highest among the world's oil-exporting countries (Ovaga, 2012).

Table 3: Price of PMS from 1986 to 2012 (N/Litre)

Year	Price per Litre (N:k)	Fluctuations	Comments
1986	0.395	-	Subsidy withdrawal began as SAP was introduced
1987	0.42	Increase	SAP implementation
1988	0.60	Stable	
1989	0.60	Stable	
1990	0.60	Stable	
1991	0.70	Increase	President Babangida
1992	0.70	Stable	Change in new government's policy (Shonekan)
1993	3.25	Increase	
1994	11.0	Increase	New military regime (Gen. Abacha)
1995	11.0	Stable	
1996	11.0	Stable	
1997	11.0	Stable	
1998	11.0	Stable	
1999	20.0	Increase	New regime (Abdussalami)
2000	22.0	Increase	New PPPRA and policy
2001	22.0	Stable	
2002	26.0	Increase	
2003	39.50	Increase	
2004	52.00	Increase	
2005	65.00	Increase	
2006	65.00	Stable	PSF to stabilize prices
2007	75.00	Increase	Global oil price hike
2008	75.00	Stable	
2009	65.00	Decrease	Due to public outcry
2010	65.00	Stable	
2011	65.00	Stable	
2012	97.00	Increase	Commencement of phase removal of subsidy

Source: PPRA and NBS (as cited by Ogunleye and Ayeni, 2012).

Among the major OPEC member countries, as shown in Figure 3, Nigeria has the highest domestic pump price of petrol, with an equivalent price of N65 per litre, followed by Iran, with N58.4 per litre (as indicated in Nigerian currency terms). This implies that Venezuela was among the countries with the highest subsidy support for the local price of petrol in 2011, with a value

of N5.84 per litre of petrol.

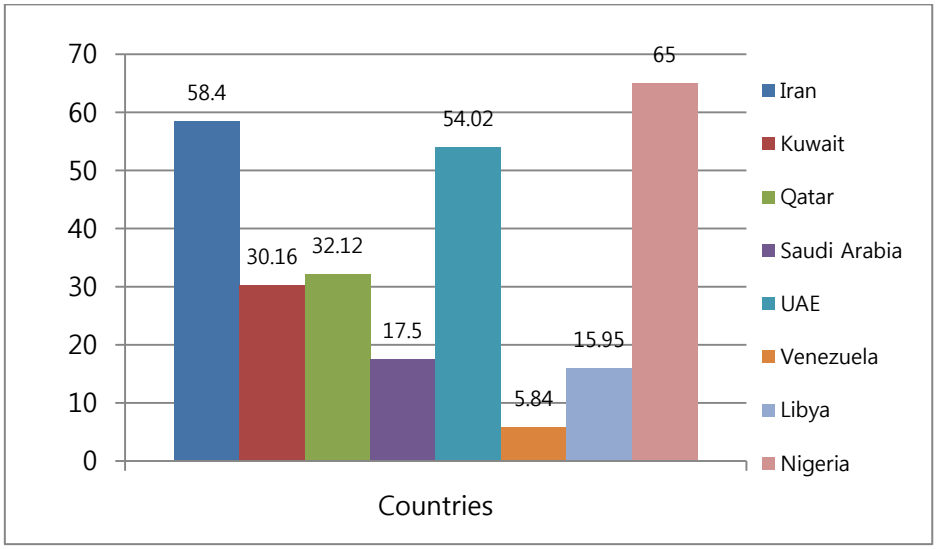


Figure 3: Pump price/litre of petrol in some oil-exporting countries.
Source: Adopted from Umukoro A. and Adeyemi A., 2011, p. 50.[13]

Petroleum Support Fund

The Petroleum Support Fund (PSF) is a pool of funds budgeted by the government to stabilize the domestic prices of petroleum products against the volatility in international crude oil and product prices. In an attempt to stabilize the domestic petroleum products' prices and to mitigate the associated problems, the government established PSF, which is in effect an interventionist fund, in January 2006. This is to attract more participation in product procurement without the hindrance of full cost recovery, which could arise in the event of an upward pressure on crude oil and product prices; to guarantee effective product supply and distribution to every nook and cranny

[13] Article titled "The Fallacy of Fuel Subsidy," *The Tell*, November 28.

of the country; and to increase the local production of products through investment in the establishment of local refineries.

In administering the fund, the pricing policy of PPPRA, which is based on the import parity principle, will be upheld. The import parity principle is used so that the concept and process of deregulation, which are the building blocks for massive investment in the economy, will not be totally expunged in the scheme of things. CBN is the custodian of the fund while PPPRA administers it. Claims from or payment into the fund will be subject to the duly verified volume of products lifted out of the approved depots to the retail outlets and sold in line with the recommended open market prices. The PSF implementation involves three phases of fund application: under-the-cost recovery, involving the payment from the fund to the marketers during the period of under-the-cost recovery, which applies when the landing cost of the products based on the import parity principle is above the approved PPPRA ex-depot benchmark; full cost recovery, in which no payment is made to the marketers if the landing cost of the products based on the import parity principle is equal to the approved PPPRA ex-depot benchmark as this reflects full cost recovery to the operators; and over-the-cost recovery, in which payment by the marketers to the fund on over-the-cost recovery applies when the landing cost of the products based on the import parity principle is below the approved PPPRA ex-depot benchmark.

1.1.6 Social protection

Due to the prior removal of the gasoline subsidy in January 2012, the government developed the Subsidy Reinvestment and Empowerment (SURE-P) Program, with the following three main objectives: (i) to mitigate the immediate impact of subsidy removal; (ii) to accelerate the economic transformation by investing in critical infrastructure; and (iii) to lay the foundation for a national safety net program.

The social protection mechanisms under the SURE-P Program include maternal and child health services, public works for women and youth, urban transport development, and vocational training.

The major terms of its reference are to determine, in liaison with the Ministry of Finance and Ministry of Petroleum Resources, the subsidy savings estimates for each preceding month, and to ensure that such funds are transferred to the Funds' Special Account with the Central Bank of Nigeria; to approve the annual work plans and cash budgets of the various project implementation units (PIUs) within the ministries, departments, and agencies (MDAs), and to ensure the orderly disbursement of funds by the PIUs to certify and execute projects; to monitor and evaluate the execution of the funded projects through a periodic Poverty and Social Impact Analysis (PSIA), among other methods; to update the president regularly on the programme; to periodically brief the Federal Executive Council (FEC) on the progress of the

programme; and to appoint consulting firms and external auditors of international repute to provide technical assistance to the committee in terms of financial and project management.

1.1.7 Consequences of subsidies

Fuel subsidies increased sixfold in the local currency between 2006 and 2011, and surpassed USD11 billion in 2011, constituting 4.7% of the GDP, as indicated in Table 4. It has become a huge burden that the funding is almost unsustainable compared to the infrastructural budget proportions, and primarily does not impact the low-income and poor people, who comprise the majority of the population. This gave rise to a more concrete reason for the government to implement subsidy removal initiatives as a way forward.

Table 4: Monetary Proportion of Subsidy on Nigeria's GDP

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
USD billion	2.0	2.3	5.4	2.7	5.3	11.4
% of GDP	1.3	1.4	2.6	1.6	2.3	4.7

Sources: IMF for 2006-2010; Central Bank of Nigeria for 2011.

It is quite unusual to have a market with deregulated diesel and regulated petrol prices, leading to a much greater apparent consumption of petrol than diesel. According to the EIA data, the petrol-to-diesel consumption ratio increased from 2 in 2000 to 7 in 2010. The major illegal petrol markets in

Nigeria engage in product adulteration, diversification of subsidized petrol into storage for selling at a later time, when there is a price hike, out-smuggling to the neighbouring countries, and presenting subsidized petrol as having just been imported to claim the subsidy reimbursement for the second time. The scale of corruption also debunks the government's argument that the savings from subsidy removal can be used more productively and equitably.

The subsidy withdrawal by the government affects the stakeholders involved either in a positive or negative way. Appendix 8 shows the results of an analysis of the parties involved, with the corresponding remarks on their performances. Another improved-refinery-utilization scenario provides a similar remark about the stakeholders.

1.2 Research Objectives and Questions

Due to the import of refined petroleum products at higher prices and to their domestic sale at discounted rates to satisfy the majority poor or low-income earners, and to the increases in the demands for petrol and kerosene, which largely affect the government's budget, the Nigerian government decided to remove its subsidy on petrol and kerosene so that it could channel the funds towards its other development projects.

The objective of this study was to investigate the impact of petrol subsidy withdrawal on the economic performance of Nigeria. The research questions for this study seek to determine the influence of petrol price increments (due to subsidy withdrawal) on the domestic consumption (demand) and the

resultant effect on the country's economic growth (GDP), as follows:

(1) What is the impact of petrol price subsidy on the economic performance of Nigeria (GDP)?

(2) What is the relationship between consumption and income?

Research Hypotheses

- Petrol subsidy has a negative effect on economic performance.
- Income has a positive effect on consumption.

Research Motivation

Nigeria has the highest population (about 170.1 million)[14] and is one of the most extensive countries in terms of areal size in Africa. The country consists of two major regions, North and South. The southern coastal region houses Nigeria's oil production and export terminals as well as its refined-products receiving terminal, while the most populous region, the northern region, is landlocked in the hinterland. Although Nigeria produces oil, its domestic refining capacity is by far lower than its domestic demand. As a consequence, refined petrol has to be imported to bridge the shortfall in the domestic supply. Consequently, to ensure the uniform pump price of petrol across the country, the federal government subsidized the cost of petrol transport from the southern source area to the northern high-demand areas.

[14] Nigeria Demographic Profile 2013 <www.indexmundi.com,nigeria/demographics_profile.html>.

The government also pays the cost differential of imported petrol to the marketing companies because the landing cost is higher than the regulated pump price.

The estimates of the foregone revenues in the oil-exporting countries due to subsidy implementation approximate one-third of the export revenues.[15]

According to Jensen and Tarr (2002), on subsidy reform in Iran, as the demand declines and the exports increase, the outputs of the energy-intensive sectors decline by 25-65%, and the activity in farming, food production, and other services increases.

Clements et al. found that a reduction in the subsidy in Indonesia increases the production costs, leading to price increases in other sectors (energy-intensive), which in turn reduce the overall consumer product demand. In turn, the production is decreased, leading to a lower demand for labour and lower capital inputs, household incomes, and consumer demand.

This research also analysed the impact of petrol domestic price increments on the economic performance of Nigeria as one of the major oil-exporting developing countries with a very low domestic petrol price in the past, and due to the fact that fuel subsidy is the major political and economic issue that is currently being discussed and debated on by the majority of the poor Nigerians. The analysis covers the period from when subsidy withdrawal began (1986) to 2012 so as to capture its reflection on the national incomes during such period.

[15] Kosmo, 1989, p. 244.

Chapter 2: Nigeria's Petroleum Industry

2.1 Nigerian Economy

The Nigerian oil industry remained entirely in the hands of IOCs to control the prices of the refined petroleum products in the domestic market, the collection of fees for exploration licenses and production leases and also of taxes and royalties from crude oil throughout the 1960s, until the Nigerian National Petroleum Corporation (NNPC) came into existence in 1977 to manage the country's interest in the oil industry.

Nigeria's entry into OPEC in 1971 led to the policy of requiring all investments in the economy to have a minimum of 60% Nigerian equity participation (as OPEC required its member states to nationalize their oil industry).

2.2 Downstream Petroleum Regulatory Framework

The Nigerian oil and gas industry is mainly divided into three major sectors: the upstream, midstream, and downstream sectors. The downstream sector of the industry refers to the refining of petroleum and the processing and purification of raw natural gas, and to the marketing and distribution of the products derived from petroleum and natural gas. The downstream sector touches the consumers through products such as petrol, kerosene, and diesel, and other processed petroleum products, natural gas, and petrochemicals. Midstream operations are often included in the downstream category, and are

considered part of the downstream sector, along with the major agencies, as indicated in Figure 4.

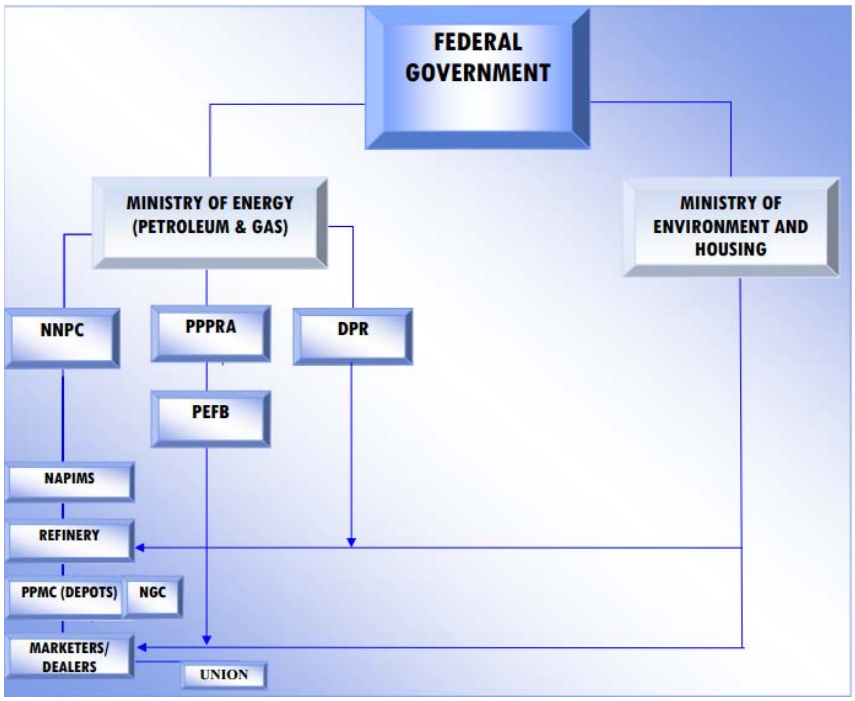


Figure 4: Structure of Nigeria's petroleum downstream industry.

Source: Agusto & Co.

Ministry of Energy (Petroleum and Gas)

All the agencies involved are under the umbrella of the ministry, which acts as the central nervous system, coordinating all the industry's activities on behalf of the government. In short, NNPC consists of NAPIMS, PPMC (mainly the depots), the refineries (as there is no private refinery but only refineries with purely federal investment), and the petroleum marketers. PPPRA manages PSF, established in 2006 to stabilize the domestic fuel prices.

Central Bank of Nigeria acts as the custodian of the fund. The pricing template uses the principle of under-the-cost recovery for reimbursement and over-the-cost recovery for payment into the fund, based on the international costs, charges, and controlled profit margins. Thus, PPPRA approves the import quotas for petrol and the eligibility for subsidy reimbursement while the Petroleum Equalization Fund (PEF) Management Board equalizes the transportation costs for pan-territorial pricing. DPR was established solely to oversee the activities in the oil and gas industry, but it is also under the Ministry of Petroleum Resources, for monetization.

Department of Petroleum Resources (DPR)

DPR, as an inspectorate, is an arm of the Federal Ministry of Petroleum and Mineral Resources. Section 10 of the NNPC Act provides for the establishment of the Petroleum Inspectorate (DPR), which shall be an integral part of the corporation. To this effect, DPR's responsibilities include the issuance of permits and licenses for all activities connected with petroleum exploration, production, refining, storage, marketing, transportation, and distribution when the specifications have been verified.

The enforcement of the stipulated price regime is based on the approved benchmark prices in collaboration with PPPRA and obliges the submission of all the necessary information and data relating to product procurement, supply, and distribution (for both import and local products).

DPR acts as an agency for the enforcement of the provisions of the

Petroleum Act, NNPC Act, or any other relevant law, and also to collaborate with PPPRA and PEF on intelligence monitoring to check malpractices. There are many instances, however, when their responsibilities overlap with those of PPPRA[16], engendering the issuance of policies by both bodies on the same issues. There is a continuous emphasis by the industry players on harmonizing these bodies or on clearly defining and delineating their responsibilities.

Petroleum Product Pricing Regulatory Authority (PPPRA)

This agency came into being from a special committee that was set up to review the Petroleum Product Supply and Distribution (SCRPPSD) drawn from various stakeholders and other interest groups to look into the problems of the downstream petroleum sector. Before the establishment of PPPRA, the downstream sector was characterized by the pseudo-scarcity of petroleum products leading to long queues at the service stations; low capacity utilization of the countries' refineries resulting from the poor state of the country's refineries; rampant fire accidents resulting from the mishandling of products, pipeline leakages, and vandalisation; smuggling of petroleum products to the neighbouring countries due to the subsidy on petroleum products; and also the low investment opportunities in the sector.

PPPRA was given the responsibilities of planning and programming the receipt and distribution of petroleum products to ensure uninterrupted product availability in the country based on the determined petroleum product supply

[16] Agusto & Co., 2008, p. 21.

gaps. The agency's staffs are also deployed to monitor and verify the data on product reception and distribution at the jetties, refineries, and depots nationwide. The creation of an information databank through liaison with all the relevant agencies makes it possible to facilitate informed and realistic decision-making on pricing policies.

PPPRA must collaborate with DPR with regard to the adherence to the product specifications and HSE standards; with PEFMB and other stakeholders with regard to the product movements to ensure efficient product supply and distribution to every part of the country; and also with CBN/FMF with regard to data exchange, FOREX allocation, and reconciliation. The necessity of embarking on a wide publicity and enlightenment programme to educate the stakeholders and the public at large on the benefits of the initiative (PSF) paved the way for the establishment of PPPRA, which has the ability to carry out such programme.

Security of supply is provided through collaboration with NNPC and other marketers to convince the latter to release their reserved stocks into the market in the event of emergencies and supply gaps arising from the inability of the marketers to fulfil their obligation of product procurement, and from shortfalls in refinery production.

Petroleum Equalization Fund Management Board (PEFMB)

PEFMB was established to equalize the transport cost arising from the distribution of petroleum products to all parts of the country — i.e., the cost of transporting petroleum products from the depot (source) to the point of sale.

This is to ensure that petroleum products will be made available in the country's retail outlets at uniform prices, and to prevent petroleum product shortage. Following the partial deregulation of the industry, the board is responsible for both the petroleum product equalization scheme and the bridging scheme.

The equalization scheme is intended to entrench the governmental policy of uniform pricing for petroleum products nationwide while the bridging scheme is designed to minimize or eliminate scarcity of petroleum products in the parts of the country that experience shortages. Shortages arise when the depots serving the area are dry due to the vandalisation of the pipelines or the closure of the refinery supplying them due to turnaround maintenance (TAM). The equalization scheme considers the following oil products: premium motor spirit (PMS), also known as petrol; dual-purpose kerosene (DPK); and automotive gas oil (AGO) or basically diesel.

Price Equalization Scheme

Marketers with outlets located close to depots contribute to PEF while those marketers whose outlets are located farther away from the depot claim from the fund. The identification of contributions and claims is done in a scientific way, although the parameters, such as the transport differential zones (TDZs), zonal transport zones (ZTRs), and national transportation averages, are considered. The depot district is the area of the country served by a depot, which is determined by the geographic location of the depot.

The national transportation average is the standard transport cost that the consumers of petroleum products pay all over the country. It is the cost that is sufficient to transport a litre of petroleum products from one zone to another (maximum of 100 km apart). It is included in the uniform price of the product. It is arrived at after considering the cost of the trucks, the compensation to be given to the truck owners for maintenance, the fees for the drivers and their assistants, the cost of the fuel and lubricants, the payment for the insurance, and the return on investments.

Central Bank of Nigeria (CBN)

According to the 2007 Act, CBN, the financial regulatory authority, is charged with the overall control and administration of federal government's financial sector policies, issuing a statement of account of the fund to PPPRA on a monthly basis, and issuing of FOREX to importers subject to the prevailing import procedures/guidelines of CBN. All the disbursements of the FOREX to oil product importers and also the debits from the marketers' accounts are accounted for monthly and rendered to PPPRA to enable maximum returns and to achieve fund accounting security.

Oil Marketing/Trading Companies (OMCs/TCs)

(1) Import, supply, and distribute petroleum products nationwide.

(2) The oil marketers are meant to comply with the rules and regulations set by PPPRA concerning product scheduling, shipment to jetties, product

transport through the pipeline network/trucks/rail to storage depots, and evacuation to retail outlets.

(3) Submit on a monthly basis the data on product supply and distribution.

(4) Allow PPPRA operatives to monitor the product movements from the jetties to the depots and from the depots to the retail outlets.

(5) Furnish PPPRA with three spiral-bound copies of the import documents sequentially arranged as prescribed in the checklist in Appendix II.

The Nigerian Case on Petrol Subsidy

The Nigerian case is that of the imposition of a consumer subsidy. This translates into a consumer surplus whereby the consumer pays for fuel at a price of N65 per litre, which is less than the current world market price of imported fuel inclusive of the distribution cost of N142 per litre. The consumer benefits by also purchasing the commodity/product in quantities that are at variance to the ideal quantities to be demanded by the consumer public. The supplying community (oil marketers) enjoys the producer's surplus as they are now inclined to sell larger quantities at the market price. These benefits from the subsidy are in some sense equally shared by the producer and consumer communities, the snag being that the consumer surplus is shared by a fairly large population of fuel consumers while the producer surplus is split amongst a smaller community of the importing community in Nigeria.

Structure of Petrol Subsidy in Nigeria

The petrol subsidy is provided in two ways: (i) when the distance from the port of importation (in this case, Lagos) to the region of consumption exceeds 400 km, then there is subsidy provision to the marketers to cover the transport cost; and (ii) to the pump price, to make it uniform in accordance with the government's decision to reduce the high cost impact on the low-income consumers. Thus, the amount of subsidy equals the differential between the consumer pump price and the international cost of importation or domestic production.

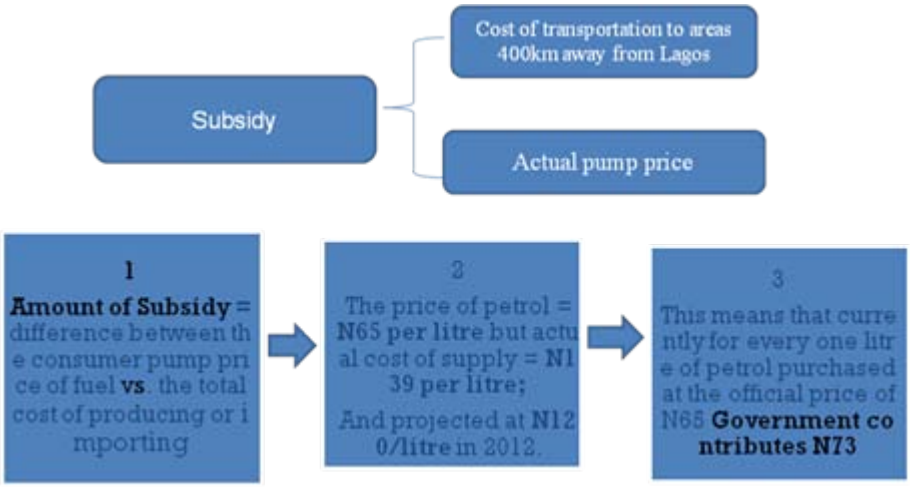


Figure 5: Structure of petrol subsidy in Nigeria.
Source: MPR Nigeria, 2013.

The economic theory postulates that the actual cost of subsidies exceeds the transfers offered by the government to the producer and consumer community. There is a notion of a residual portion that accounts for the opportunity cost of the inefficient allocation of resources by both the

consumer and supplier. This residual is identified as the dead-weight burden borne by the society and thereby has considerable social welfare implications when the possible opportunity cost of corruption borne by the society is factored.

The Nigerian situation is somewhat peculiar and manifests itself in a rather intriguing way that almost hints at the notorious Nigerian factor. This producer surplus in Nigeria should be redefined as an importer surplus in the sense that with the exception of NNPC, an indigenous operator in Nigeria, the other beneficiaries of this surplus are the foreign suppliers of refined products. Besides, NNPC's role in this regime is primarily that of an importer of refined fuel.

This is contrary to the theory that assumes that the supplying community is predominantly indigenous, and that even if the production is inefficient, this surplus should at least be enjoyed in the home country if the productive capacity exists. The imposed price control and mode of regulation in Nigeria discourages the local refining of crude oil, and it is technically and almost effortless to import fuel. The disincentives are exacerbated in the manner in which NNPC imports fuel: in the form of swapping a barrel of crude oil for an equivalent barrel of refined products. This roughly translates into the ratio of a barrel of crude oil to half a barrel of gasoline, a level of supply that exceeds the domestic consumption rate. This excess supply fuels the black market transactions between Nigeria and its neighbouring countries as well as the subsidy market, and a low-risk enterprise involving selling to the importer is

virtually guaranteed. This situation gives further insight into why the fuel business is perceived as a very lucrative source of livelihood for the privileged group of importers but certainly a loss to the society.

There is certainly a case for the removal of subsidies in Nigeria. Nigeria currently does not meet any of the listed criteria in the framework adopted in a UNEP 2003 study on energy subsidies that would justify the continued imposition of a subsidy.

Table 5: Factors for Subsidies' Critical Success

Criteria Specifics	**Nigeria**
Well targeted: The targeted beneficiary group should be able to receive the subsidies.	The transmission effect is distorted. The major beneficiaries are the importing community and the high-income petrol users.
Soundly based: Must be rationalized based on the results of well-thought-out research	No evidence that this thought process was put in place at the inception of this concept (There might have been the mindset that oil-producing countries could achieve populist gains through fuel subsidy.)
Transparent: The public must have access to the full cost of the subsidy.	Not transparent: The actual cost of the subsidy is not easily accessible in the public documents generated by the key government agencies involved in such exercise, namely PPRA, DPR, NNPC, and CBN.
Efficient: Should not undermine the incentives to efficiently allocate resources	The current system encourages excessive consumption and supply by both the consumers and the producers.
Practical: Must be affordable and must be administered in a cost-effective manner	The financing of the current program is not sustainable, especially when the price of crude oil rises in the world market.
Time-limited: Subsidy programs should be time-limited to eliminate an unhealthy dependence on subsidies either by the consumers or the producers.	Subsidy imposition has a long history in Nigeria, spanning three decades.

Source: CPPA, 2012

Effect of Subsidy on the National Budget

Subsidy funds can otherwise be used for many other pressing social and infrastructural development projects in sectors like health, education, power supply, and roads. As indicated in Figure 6, in the 2011 budget, the payment for the subsidy for the energy sector surpassed the capital expenditure by close to N200 billion. This shows that the funds available to the federal government for fuelling economic development projects are insufficient.

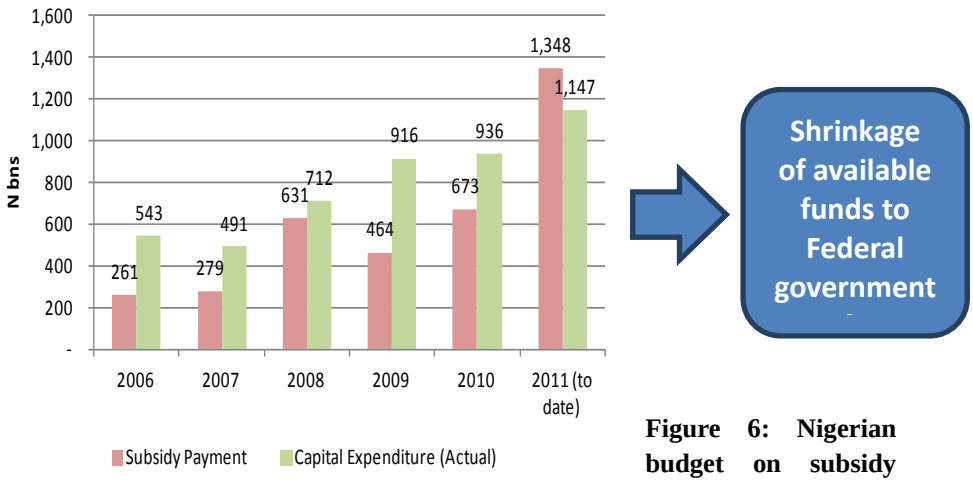


Figure 6: Nigerian budget on subsidy and capital expenditure.
Source: Ministry of Finance, Nigeria, 2013.

Effect of Subsidy on Oil and Gas Resources

The forecasted analysis of volume of savings in the year 2005 (10^6 barrels) by some major oil-producing developing countries indicated that a lower domestic price of oil and gas resources (due to the subsidy to half the global price) leads to more consumption and thus lowers the savings for the future

higher demand. This is shown in Table 8 for the major oil-exporting developing countries in the world.

Table 7: Volumes of Oil Savings

	Scenarios	
	Subsidized Price Equal to Half of the Global Price	**Subsidized Price Equal to the Global Price**
Algeria	15.6	23.1
Iran	127.4	167.5
Nigeria	27.0	44.9

Source: Birol et al., 1995.

Chapter 3: Literature Review

3.1 Theoretical Framework

Many developing countries have pervasive energy subsidies even though some countries have made enormous efforts to reduce or even eliminate their commercial energy subsidies to reduce their high economic losses amounting to billions of dollars (especially in subsidies for petroleum products, electricity, natural gas, and coal). Thus, the estimates of the forgone revenues in the oil-exporting countries approximate one-third of all oil export revenues (Kosmo, 1989). Countries need to move to rationalize energy prices at the present time as the global prices have now stabilized and the domestic inflation rates are substantially lower than in the past. The reduced subsidies can provide the world with an insurance policy against future price shocks similar to the ones in the 1990s.[17]

Based on the related literature, the oil-exporting countries are among the most energy-intensive economies globally due to the rise in the domestic demand for oil and the fact that the energy-intensive industries are developing, as mentioned by Oliver and Majda (2013). According to their research on whether there is a relationship between energy consumption and economic growth, where they used recently developed panel econometric techniques, there is a long-run equilibrium relationship between energy consumption and economic growth. As petrol is considered among the major fuels used by the

[17] Kosmo, 1989.

transport and other industrial sectors in Nigeria, it has a great tendency to influence the economic performance of the country.

The major characteristics of the energy markets in oil-exporting developing countries are the high levels of subsidies on petroleum products and the low energy use efficiency, as determined in the research conducted by Birol, Aleagha, and Ferroukhi (1995) on the economic impact of subsidy phase-out in three oil-exporting developing countries (Algeria, Iran, and Nigeria), where they used the standard econometric approach. It was suggested in such work that the partial or total removal of subsidies and/or the non-price improvement of the energy use efficiency would allow these countries to save substantial amounts of oil from domestic consumption, which would in turn be translated into additional revenues. There has been a pronounced waste of the resources needed to fuel their development, considering the oil endowment and the higher energy subsidization[18], leading to low energy prices that can be used to promote industrialization and economic diversification (to generate employment and to enhance the economy's global competitiveness).

Premium motor spirit (widely known as petrol or gasoline) is the most widely consumed petroleum product in Nigeria mainly in the transport sector. The study by Ukah (1999) involving an empirical analysis of the impact of the

[18] According to the IEA measures and report, oil-exporting countries are among the largest energy subsidizers (Joint Report by IEA, OPEC, OECD, and World Bank on Fossil Fuel and Other Energy Subsidies: An Update on the G20 Pittsburg and Toronto Commitments, 2011).

gradual withdrawal of subsidy on the domestic gasoline consumption in Nigeria between 1977 and 1999, using an OLS econometric model approach and the logarithmic function of the explanatory variables (income as real GDP, price of gasoline, and price of automotive gas oil), found that subsidy withdrawal or increasing the price of gasoline has no significant effect on the domestic consumption of the commodity, implying an inelastic response of price to demand. Ukah (1999) further asserted that increases in the prices of petroleum products will definitely increase the revenue base of the government and marketers, and will impoverish the consumers, in the end sending negative shocks to the economy.

Another study was recently conducted by Akanbi et al. (2013) on gasoline as the highest consumed petroleum product in Nigeria, using the basic descriptive statistical method and Pearson's product-moment correlation coefficient. The results showed that the deregulation of the downstream oil sector did not yield the desired result in terms of the decrease in the prices of petroleum products. Also, it was discovered that despite the increase in the prices of petroleum products, their rate of consumption continued to increase. In developing countries, the lower-income households use relatively more kerosene as a percentage of household income than the higher-income ones. Thus, kerosene subsidy primarily benefits the middle- and upper-income classes[19], which may be the main reason for the government's insistence on continuing the implementation of the kerosene subsidy pricing scheme in the

[19] Kosmo, 1989.

country.

The fuel subsidy removal has also affected the prices of food items, according to a study conducted by Ekine and Okidim (2012) using simple regression analysis, where it was recommended that the policy of fuel subsidy removal be implemented gradually to avoid a further increase in the prices of food items (which will in turn lead to financial inflation). Considering the large dependence on the oil resources and industry, any effect on the petroleum industry, particularly petrol, which drives 80% of the country's socioeconomic and national livelihood, will have a multiplier effect on the people (Desmond, 2012). This was also evident from the social accounting matrix (SAM, 2008) data analysis conducted by Tri Widodo et al. (2012) on Indonesia to analyse the impact of fuel subsidy withdrawal on government spending, where it was observed that the overall effect of fuel subsidy removal was negative due to the high reliance of the sectors on fuel subsidy (the multiplier effect of removal is higher than that of any direct reallocation scheme) and also the non-consideration of reduction in inefficiencies such as traffic congestion, excessive use of personal vehicles, and unequal distribution of subsidized fuel among the energy sectors.

The results of the study conducted by Oliver Damette and Mada Seghir (2013) on the ongoing debate over whether there is a relationship between energy consumption and economic growth, where a panel econometric technique was used, indicated that there exists a long-run equilibrium relationship between energy consumption and economic growth. Furthermore,

the empirical evidence that they obtained by using a dynamic panel error correction model revealed a short-run unidirectional causality from energy consumption to economic growth, whereas in the long run, it is the economic process that determines the energy consumption trend. The studies on panel VECM can be traced back to Lee (2005), who conducted a study on 18 developing countries from 1975 to 2011 and found that causality runs from energy consumption to GDP.[20] This shows the evident need to assess the impact of petroleum product consumption on the economic performance of Nigeria, which is among the most energy-intensive oil-exporting countries in the world, due to the rising demand for petroleum products and the development of energy-intensive industries therein.[21]

There is a close relation between the measured subsidy rates and the potential for energy savings. Even though Indonesia has high subsidies (27.51%), it has relatively low energy savings (7.09%)[22] due to its high biomass percentage and the concentration of its energy subsidies on petroleum products, which have very low elasticities of demand and thus less energy savings from subsidy removal. Nevertheless, Indonesia's gasoline/diesel consumption continued to decline as a result of the subsidy reductions in late June 2013.[23]

Clements et al. (2003), in their computable general equilibrium study of

[20] Chiou-Wei et al., 2008, p. 3064.
[21] Damette, 2013.
[22] IEA, 1999, World Energy Outlook Insights, Looking at Energy Subsidies: Getting the Prices Right, OECD, Paris, p. 65.
[23] OPEC, Monthly Oil Market Report, September 2013.

Indonesia's fossil fuel producer subsidy reform, found that a reduction in the subsidy increases the production costs, which leads to price increase in other sectors, particularly the energy-intensive sectors such as utilities, construction, and mining and quarrying, which reduces the overall consumer product demand. In turn, the production is decreased, which leads to a decreased demand for labour and capital inputs, which in turn reduces household incomes, thereby reducing the consumer demand. In the Keynesian (the real output is reduced in the short term) and non-Keynesian (decline in government deficit and public debt resulting from the decline in subsidies) modelling study conducted by Clement et al., in both cases, the aggregate price level increased by 1.1% as a result of the 25% (a fiscal multiplier of two on 1% of the GDP represented by the subsidies) increase in petroleum product prices. In the Keynesian model, the reduction in subsidies reduced the real output by 2% due to the second-order effects on production and income.

3.2 International Petrol Subsidy Experience

Several developed and also developing countries have implemented fossil fuel subsidy policy reforms. These countries include Argentina, Indonesia, Ghana, South Korea, Mexico, China, Russia, USA, and many others. Six important reform approaches were identified by the International Institute for Sustainable Development (IISD): research, establishment of reform objectives and parameters, building a coherent reform strategy, implementation, clear progress frames, and monitoring and evaluation. Some of these countries'

experiences are highlighted below.

Ghana (Petrol)

The subsidy reform attempt started in 2001 in collaboration with the International Monetary Fund (IMF), as a part of the Poverty Reduction and Growth Facility Program. The fuel prices were raised by 91% by the government in a bid to deregulate the sector, and in June 2001, an automatic price setting mechanism was introduced to resuscitate the state-owned Tema Oil Refinery (TOR) and to pay its mounting debts, but it could no longer be sustained and was abandoned in 2002, when the international oil prices rose. The debt continued to ascend, equalling about 7% of the GDP (IISD, 2010).

A second unsuccessful attempt was made in 2003 but was suspended in June of the same year due to the rise in international oil prices. To mitigate the subsidy removal impact on the poor, the Ghana government introduced a number of policy measures: establishment of the Deregulation Mitigation Levy and Unified Petroleum Fund, introduction of tuition fees in public primary and secondary schools, increasing the number of mass transit buses, introduction of a price ceiling on public transport fares, increasing the funding for healthcare services in rural areas, raising the daily minimum wage from USD1.24 to USD1.50, and also the implementation of rural electrification projects. The government also intends to continue its cross-subsidy on kerosene and liquefied petroleum gas (LPG).

Due to the subsidy provided for kerosene, it was used for the adulteration

of diesel and also for smuggling to the neighbouring countries with higher sales prices. According to IISD (2010), the Ghana case was recorded as a success for the following reason: “Research was conducted to identify those most likely to be impacted by reform; a communications strategy was employed to increase popular support; semi-independent and transparent institutions were established to manage fuel pricing; the domestic prices were linked with the international prices; and policies were implemented to reduce the impacts on the poor.”

Chile (Petrol, Diesel, Kerosene, and Coal)

Energy reform in Chile began in the 1970s, targeting the reduction of state involvement in productive activities (as part of larger social and economic reforms). The reform was done in two phases, as discussed below.

“In the first phase, from 1974 to 1977, a process to prepare the necessary economic and financial conditions for the reform in the energy sector was begun” (UNEP, 2003:125). At this stage, the energy prices were adjusted to make them closer to the prices in the global market.

“The second phase (1978-1989) emphasized institutional reforms, including those relating to the regulatory framework and legal aspects and ownership” (125). At this stage, National Energy Commission (NCE) was established to implement the energy policies. As there was privatization of oil products, the state-owned oil firm ENAP retained the responsibilities of exploration, production, importation, and refining. The oil product prices were

semi-regulated, with the ex-refinery prices freely set but in justification with the prices of imported products, in addition to a 10% importation tax. The final prices were set after the addition of the transport, storage, and marketing cost estimates in addition to the 18% VAT that was added.

The Chilean government established a price stabilization fund in 1999 to offset the effects of the international oil price fluctuations. The predetermined differential price was adjusted for the individual products, and either a loan was paid by the government or a tax was levied on the fund, depending on the difference. With the rise in international oil prices, however, the government's cost became so huge that it led to the reform of the system in 2000. A new fund was established that sets caps, and new rules required it to act as a stabilization fund and no longer as a subsidy fund.

In a simulation study, UNEP (2003) stated the possible impacts of subsidy reform as follows: "A key conclusion of the analysis for Chile is that removing oil subsidies could have bigger economic and distributional effects than removing coal subsidies. This is mainly because the consumption of oil is much larger than that of coal. Not surprisingly, the effects on the sectors concerned, namely oil refining and coal production, are much bigger in each case. The environment clearly benefits from the removal of both the coal and oil subsidies" (126-127).

Angola (Petrol)

The fuel prices are uniform in the country, controlled by the government

and heavily subsidized. Only the price of petrol was raised in September 2010. The fuel subsidies in 2011 amounted to 7.8% of the GDP (USD7.9 billion)[24], equivalent to more than 90% of the public investment spending. There exists only one small, old refinery, and the plan to build a new larger refinery has encountered a series of problems in terms of attracting investment.

Indonesia (Petrol and Diesel)

The prices of one grade each of petrol, diesel, kerosene (for households and small businesses), and LPG are controlled and heavily subsidized. The prices of other grades of petrol and diesel are market-based, but the national oil company Pertamina and not the government subsidizes the LPG sold in larger cylinders, reportedly costing Pertamina Rp.3.8 trillion (USD0.43 billion) in 2011. The price of the LPG subsidized by the government has been frozen for years. After raising the fuel prices twice in 2005 and once in 2008, the government lowered the prices of petrol and diesel (but not of kerosene) in December 2008 and January 2009, respectively, and has not adjusted the prices since. In March 2012, the parliament voted to block the government's revised 2012 budget proposal to raise the subsidized fuel prices, and agreed to allow the option of a price increase only if the six-month average price of Indonesian crude oil rose 15% above the budget oil price (to USD121/b). The annual government expenditures on fuel subsidies soared to USD23 billion in 2012.

[24] IMF, August 2012.

Table 8: Indonesia's Annual Fuel Subsidy Expenditures as % of GDP

Year	2006	2007	2008	2009	2010	2011	2012
USD billion	7.0	9.2	14.3	4.3	9.1	18.8	22.6
% of GDP	1.9	2.1	2.8	0.8	1.3	2.2	2.6

Source: Government of Indonesia, 2013

Jordan

The government controls the fuel prices and removed its subsidies from all fuels, except LPG, in February 2008, and adopted a monthly price adjustment mechanism but stopped adjusting the prices of petrol, diesel, and kerosene in January 2011, which were raised in December 2010 but lowered in January 2011 in response to the events in Tunisia and elsewhere in the region. An expert panel formed by the prime minister in May 2011 recommended the use of smart cards for subsidized goods instead of price subsidies. The kerosene and diesel prices remained unchanged, except for a brief rise in September 2012. In May 2012, Jordan raised the price of petrol to JD1 (USD1.41)/litre from JD0.795 (USD1.12), and substantially raised the electricity tariffs for the major industrial and service sectors. In November 2012, unable to shoulder the growing budget deficit, the government increased the price of LPG in 12.5kg cylinders by 54%, and the kerosene and diesel prices by 33%. The government began making monthly adjustments in December 2012 for all fuels, except LPG. For a certain period, the retail price was lower than the FOB price, signalling a large subsidy.

Jordan has one refinery with an about 100,000 bpd capacity, and imports

100% of its oil demand.

Table 9: Jordan's Annual Fuel Subsidy Expenditures as % of GDP

Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
USD million	707	394	432	278	61	94	714
% of GDP	5.6	2.6	2.5	1.3	0.3	0.4	2.4

Source: IMF, 2013

Malaysia

The prices in the remote areas are higher, and the government has been taking steps to implement a "one nation, one price" policy to equalize the prices across the country. An additional diesel subsidy scheme for eligible commercial vehicles and river passenger boats was introduced in the 2002 budget. Four groups of consumers have been entitled to additional diesel price subsidies: fishing boats, which paid the lowest price per litre; passenger river boards; fleet card holders; and public transport operators. In June 2011, the government suspended the additional subsidy scheme for nine vehicle categories and certain fishing boats. The annual subsidies for the three fuels had increased to USD6.6 billion by 2011, with petrol and diesel dominating in most years.

Table 10: Malaysia's Annual Fuel Subsidy Expenditures as % GDP

Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
USD billion	2.2	2.0	2.6	4.6	1.6	2.8	6.6
% of GDP	1.6	1.3	1.4	2.1	0.8	1.2	2.4

Source: Government of Malaysia

The energy subsidies remained high in 2012, but the increased revenues from the high oil prices and the strong tax collection have more than offset the subsidy increases.

As can be seen in Table 11, some studies have been conducted on the fossil fuel subsidy reforms in different sectors. In the study conducted by Burniaux et al. (2009), it was predicted that there will be a 0.2% global GDP increase by the year 2050, and also 0.2 and 0.1% GDP increases in the OECD and non-OECD countries, respectively, while in their other research, a peak outcome of a 0.7% global income increase by 2050 was predicted. Fossil fuel subsidy reform impacted the non-OECD countries the most, which are expected to have a 1.8% annual income increase by 2020, according to Larsen and Shah (1992).

Table 11: Summary of Economic Effects of Fossil Fuel Subsidy Reform

Study	Income or GDP Increases (Global)	Income or GDP Increases (OECD)	Income or GDP Increases (Non-OECD)	Total Economic Efficiency Cost
Burniaux et al., 2009	0.2% higher in 2050	0.2% higher in 2050	0.1% higher in 2050	NA
OECD, 2000	0.1% by 2010	NA	NA	NA
Saunders & Schneider, 2000	NA	0.1% higher in 2010	0.45% higher in 2010	
IEA, 1999	NA	NA	0.73%	USD17.2 billion
Burniaux et al., 1992	0.7% per year up to 2050	0.1% per year up to 2050	1.6% per year up to 2050	NA
Larsen & Shah, 1992	NA	NA	1.8% per year up to 2020	USD33 billion

Source: The Global Subsidies Initiative, 2010

In summary, most of the previous researches that applied a similar methodology demonstrated that the domestic demand or consumption of petrol is not affected by price fluctuations, but subsequently, the increases will positively influence the national income, as indicated in Table 12. This inclination in petrol influences the price increase of food items, as observed in a study conducted by Ekine and Okidim (2001). The use of simple regression by Maxwell and Harold (2010) to analyse the fuel subsidy impact in Nigeria demonstrated that the excessive demand for fuel is being reduced through subsidy withdrawals.

Table 12: Previous Empirical Researches with a Similar Methodology

Author(s)	Type of Study	Methodology	Results & Conclusion
Birol, Aleagha, & Ferroukhi (1995)	The Economic Impact of Subsidy Phase-out in Oil in Algeria, Iran, and Nigeria	Standard econometric approach and autonomous energy efficiency improvement	Petrol consumption is not responsive or sensitive to price change. Petroleum price increase positively affects national income.
Ekine & Okidim (2001-2002)	Analysis of the Effect of Fuel Subsidy Removal on Some Food Prices in PH and Nigeria	Tables, percentages, simple regression	Fuel price increase also increases the prices of food items.
Ukah	Empirical Analysis of the Impact of the Gradual Withdrawal of Subsidy on Petrol Consumption in Nigeria (1977-1999)	Econometrics (regression analysis of elasticities)	The consumption of PMS is not responsive to price change. The prices of petroleum products have a positive effect on government revenue.
Maxwell & Harold (2010)	Fuel Subsidy in Nigeria: Fact or Fallacy	Simple regression	Fuel subsidy withdrawals reduce excessive fuel demand.

Chapter 4: Research Method

4.1 Data and Methodology

Data Used and Coverage

To conduct a study using econometrics, which consists of a series of variables on prices over time, there is a need to net out the effect of inflation by adjusting the nominal prices to a base year (by adjusting the values into the year 2005). This is shown as follows:

Real value = (nominal value) x (adjustment factor)

The adjustment factor was formed using the CPI measures. Thus:

Real $value_Z$ = (nominal $value_Z$) x ($CPI_{base\ year}/CPI_Z$).

The analysis will be based on the annual series of petrol prices, starting from the year when gradual subsidy withdrawal began (1986).

Table 13: Variable Descriptions and Sources

Variable Name	Description	Source
Y	Annual income[25] (million naira)	World Bank annual data
PC	Petrol consumption (billion litres)	PPPRA, Nigeria
PP	Petrol price (naira per litre)	
PS	Petrol subsidy (naira per litre)	Min of Fin., Nigeria

The raw data obtained on the Nigerian GDP was also normalized to the 2005 standard using the GDP implicit price deflator, as follows:

[25] Annual income implies GDP (Akanbi, 2013; Ovaga, 2012).

Real GDP = (nominal GDP/GDP deflator) x 100.

Table 14: Descriptive Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Y	26	8.26e+10	3.77e+10	4.27e+10	1.67e+11
PC	26	7.034615	4.560346	3.2	21.9
PP	26	39.63846	18.34783	9.1	86.5
PS	26	11.56885	7.445995	2.16	34.22

Table 14 shows the descriptive statistics of the level data that were used for the empirical study. A total of 26 observations (1986-2011) were used for this empirical study, with the standard deviations of the four variables and the respective minimum and maximum values. Also, as indicated, income was represented as “y,” petroleum consumption as “pc,” petroleum price as “pp,” and petrol subsidy as “ps.”

4.2 Model Estimation

The econometric approach was adopted in estimating the log variables to determine the elasticity of the variables and its implications.

A similar data analysis estimation method was used by Ukah (1999) for the data variables before the government implemented the Structural Adjustment Programme (SAP) 1977-1986 and 1987-1997.

This research covered the period 1986-2011 to capture the whole duration of the subsidy withdrawal effects of petrol as the major fuel used in the country for transportation and domestic cooking.

The econometric approach was used to depict the causality and the

impacts (elasticity) of the petrol price, subsidy, and demands on income (GDP).

4.3 Energy Subsidy Model Estimation

Energy pricing in oil-exporting developing countries is influenced by the sociopolitical motive of the government to use the oil endowments as a social good to benefit the following:

(i) the poor, who comprise majority of the population; and

(ii) industrial production.

In the 1970s, oil pricing policies were established, and in the 1980s, the governments could not maintain such levels of expenditures. Thus, there were balance-of-payment problems that led to the inability to meet the debt obligations.

A conceptual graph of the domestic demand for and supply of oil is shown in Figure 6.

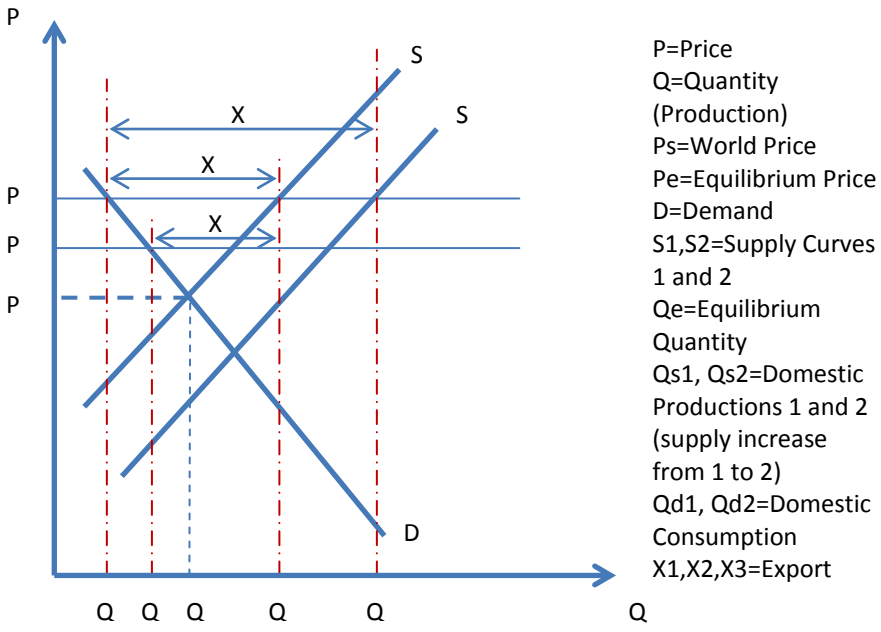


Figure 6: Domestic demand-supply concept for oil-exporting countries.
Source: Birol et al., 1995.

With the introduction of subsidy (Figure 7), the domestic price (Ps) will be below the world price (Pw). While the domestic production remains stable at (Qs1), the domestic consumption increases from Qd1 to Qd2, and the export availability falls from X1 to X2. This leads to a decrease in potential earnings (thus, a possible effect on economic growth).

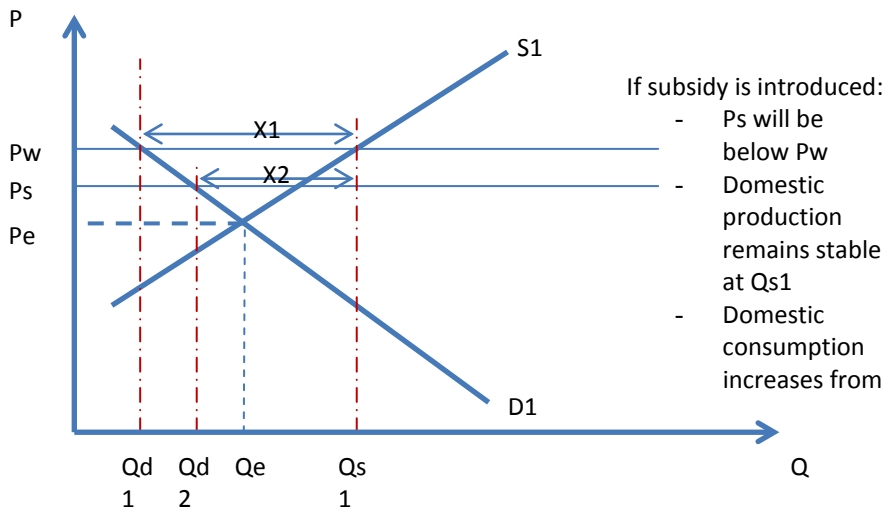


Figure 7: Subsidy for domestic consumption.
Source: Birol et al., 1995.

On the other hand, if subsidy is introduced for domestic producers (Figure 8), the supply curve shifts to the right (from S1 to S2), and the production increases to Qs2. Thus, the exports were raised threefold (as the domestic quantity demanded remained stable), but with the resources exhausted or wound down more rapidly, the long-run export capacity (revenue source) decreases.

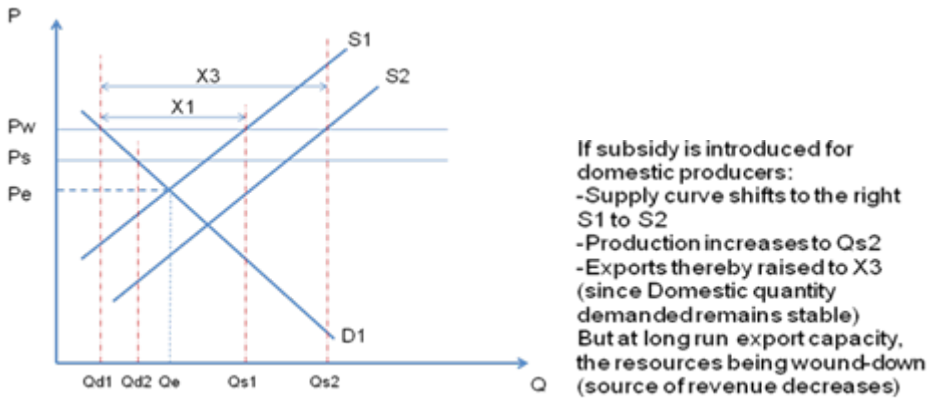


Figure 8: Subsidy for domestic production.
Source: Birol et al., 1995.

Empirical Framework

1. <u>From the demand-supply relationship</u>:

Demand = f(price, income), which also postulates that

Income = f(price, demand), and

$$Y = f(P_P, P_C), \quad (1)$$

where Y = income or GDP,

P_P = price of petrol,

P_C = petrol demand (consumption), and

$$Y = a_0+a_1P_P+a_2P_C+E_t, \quad (2)$$

where $a_1>0$, $a_2<0$; E_t = error term; a_1 and a_2 = parameters of the model and price elasticities, respectively.

The econometric approach was adopted in the model estimation, and the log of the variables was taken to help determine the elasticity coefficient of the variables as well as its implication. Therefore:

$$LnY = a_0+a_1LnP_P+a_2LnP_C+E_t. \quad (3)$$

2. Price effect on consumption

This signifies the dependence of product consumption on the price of petrol, which also relates to the subsidy per litre of petrol.

$$P_C = f(P_P, P_S), \quad (4)$$

where P_S = petrol subsidy, and

$$P_C = a_3+a_4P_P+a_5P_S+E_t, \quad (5)$$

where $a_4<0$, $a_5>0$; E_t = error term; and a_4 and a_5 = parameters of the model and price elasticities, respectively.

The econometric approach was adopted in the model estimation, and the log of the variables was taken to help determine the elasticity coefficient of the variables as well as its implication. Therefore:

$$LnP_C = a_3+a_4LnP_P+a_5LnP_S+E_t. \quad (6)$$

OLS Estimation

The multiple regression technique was first used for the examination of the economic variables of petrol subsidy, petrol price, and petrol consumption to determine if they have a relationship with income. This will indicate the overall impact of the explanatory variables and their significance on income as the dependent variable.

Multicollinearity

The existence of a high correlation between any two of the explanatory variables signifies multicollinearity. This makes the variables insignificant by

increasing their standard errors (as the t-value goes down and the corresponding p-value becomes higher). There is a need to present the correlation matrix (shown in Appendix B) as the high correlation between some of the variables has some effects, and the relationships were expressed in such a way as to omit the effects of the correlation.

Time Series Analysis

This test is considered to prove that the variable data were accounted for over a period of time (1986-2011), and to determine if an autocorrelation exists between the variables while using the OLS technique. The possibility of trend and seasonal variation between the variables makes it necessary to analyse the causal relationship between two or more of the variables. Figure 9 shows the procedure of analysing the causality of the economic parameters to be analysed.

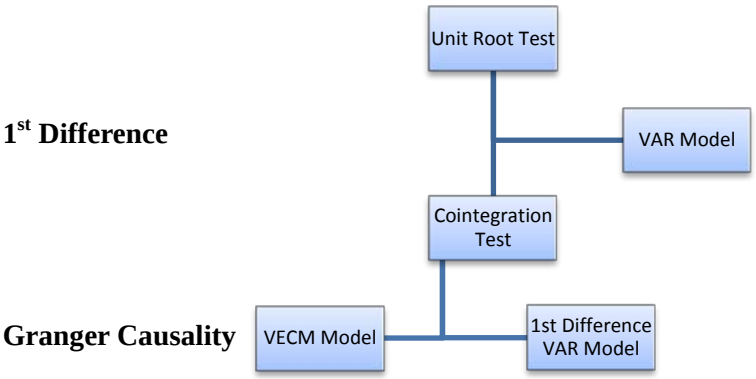


Figure 9: Time series analysis procedure.

<u>Unit Root Test</u>

The unit root test was first conducted to check for the stationarity of the

relationship by analysing the mean and variance independence over a time period. When the series is integrated to order 0 (or when there is no unit root in the time series), it is said to be stationary. Thus, to perform further empirical analysis of a non-stationary data, it has to be integrated to order 1. This is also referred to as the Dickey-Fuller test.

Consider the following two alternative models to represent the income series:

$y_t = a + b_t + e_t$, and Model 1

$y_t = a + y_{t-1} + e_t$, Model 2

where y_t represents the natural logarithm of income at time t, *t* represents a time trend, *b* is a constant that gives the growth rate of the variable, and *e* implies an error term. The initial specification implies that income equals the constant a at the initial time of zero ($y_0 = a$), and grows at a constant rate b over time. The error term explains the deviations from the trend in each year. Thus, the variable $a + b_t$ in model 1 is described as trend-stationary (TS), and stationarity is achieved by removing the time trend (i.e., regressing y_t on t). Another feature is that the variance of y_t is bounded by the variance of e_t, and the linear forecast of income approaches the time trend $a + b_t$ as the forecast horizon increases.

Model 2 is expected to be non-stationary, and it is expected that it cannot be made stationary by removing the time trend or basically detrending, but the

first difference of the series is given by $a + e_t$, a stationary process. Substitution can be done repeatedly for the lagged y_t value in Model 2 to get:

$$y_t = y_0 + a_t + \sum_{i=1}^{i} e_t. \tag{7}$$

Model 2 represents the unit root hypothesis, the term arising from the fact that the coefficient of y_{t-1} is unity.

Two variables that have a long-run relationship are said to be co-integrated. According to Elder and Kennedy (2001), "The ADF test has become the most popular among the many computing tests in the literature." The OLS model is expressed as

$$y_t = a + bt + uy_{t-1} + e_1, \text{ and} \tag{8}$$

$$\Delta y_t = (u - 1)y_{t-1} + a + bt + e_1, \tag{9}$$

implying u=1 (null hypothesis of the unit root) via t-test.

<u>Granger Causality Test</u>

Thus, the Granger causality test is conducted for the first difference of the variables due to non-stationarity after conducting the unit root test (ADF test). The Granger causality test (Granger, 1969) is designed for the detection of the causal direction between the present value of one variable and the past variables of another variable. Consider a bivariate VAR model with the following two time series y_t and x_t:

$$\Delta Y_t = \alpha_{12} + \sum_{i=1}^{T11} \beta_{11i} \Delta Y_{t-i} + \sum_{j=1}^{T12} \beta_{12j} \Delta X_{t-j} + v_{12t}, \text{ and} \quad (10)$$

$$\Delta X_t = \alpha_{22} + \sum_{i=1}^{T21} \beta_{21i} \Delta X_{t-i} + \sum_{j=1}^{T22} \beta_{22j} \Delta Y_{t-j} + v_{22t}, \quad (11)$$

where Δ is the difference operator, T is the lag order, α and β are the parameters for the estimation, and v_t is an error term. To test for the Granger causality running from X to Y, the null (H_0) hypothesis can be expressed as:

H_0: $\beta_{12j} = 0$ j = 1,2,…..q.

If H_0 is rejected (at least one of the β_{12j}s is not equal to zero), then this suggests that the past value of X has a significant linear predictive power on the present value of Y. It is then said that X Granger-causes Y, and vice versa.

<u>Johansen Co-integration Test</u>

When the relationship data are of the order I(1) but are not co-integrated, the test requires them to be transformed into I(0). The equations for the Granger type are written in the following simpler forms:

$$\Delta Y_t = \alpha + \sum_{i-1}^{q} b_i \Delta Y_{t-i} + \sum_{j-1}^{r} c_j \Delta X_{t-j} + v_t, \text{ and} \quad (10`)$$

$$\Delta X_t = \alpha + \sum_{i-1}^{m} \beta_i \Delta X_{t-i} + \sum_{j-1}^{n} \gamma_j \Delta Y_{t-j} + u_t. \quad (11`)$$

The optimum lag selection criteria for m, n, q, and r are determined through the use of the Akaike information criterion (AIC), Schwartz Bayesian information criterion (SBIC), and Hannon Quinn information criterion (HQIC)

for the most common among the tests.

$$AIC_c = \left(\frac{2n}{n-k-1}\right) k - 2\ln[L_{max}], \quad (12)$$

$$SBIC = \ln[n]k\text{-}2\ln[L_{max}], \text{ and} \quad (13)$$

$$HQIC = 2\ln\left[\ln[n]\right]k\text{-}2\ln[L_{max}], \quad (14)$$

where n = number of observations; and

K = maximum value of the log likelihood for the estimated model (i.e., to fit the parameters by maximum likelihood estimation, and to record the natural log of the likelihood).

The lag selection criteria result is shown in Table 15 for Y against PS, in which Lag 7 was selected as the optimum lag indicated by the three ICs (AIC, HQIC, and SBIC). Similarly, the optimum lag selection for Y against PS, as indicated in Table 16, shows Lag 1 as the optimum.

Table 15: Optimum Lag Selection Criteria for Y against PP

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-497.887		4.5e+21	55.5418	55.5555	55.6408
1	-447.859	100.03	2.7e+19	50.4288	50.4698	50.7256
2	-442.174	11.372	2.3e+19	50.2415	50.3097	50.7362
3	-438.555	7.2382	2.6e+19	50.2838	50.3793	50.9764
4	-436.268	4.5739	3.5e+19	50.4742	50.597	51.3646
5	-433.786	4.9633	5.0e+19	50.6429	50.7929	51.7311
6	-422.565	22.443	3.2e+19	49.8405	50.0178	51.1266
7	**-407.975**	**29.18***	**2.0e+19**	**48.6639***	**48.8685***	**50.1478***
8	**-**	**--**	**-9226.08***	**-**	**-**	**-**

Table 16: Optimum Lag Selection Criteria for Y against PS

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-513.493		2.6 e+22	57.277	57.2906	57.3759
1	**-467.976**	**91.034**	**2.6 e+20**	**52.6639**	**52.7049***	**52.9607***
2	-465.042	5.8676	3.0 e+20	52.7284	52.8506	53.2771
3	-462.575	4.9326	3.7 e+20	52.9528	53.0483	53.6453
4	-458.724	7.7034	4.2 e+20	52.9693	53.0921	53.8597
5	-457.943	1.5609	7.4 e+20	53.327	53.5771	54.4153
6	-453.019	9.8493	9.6e+20	53.2243	53.4016	54.5104
7	**-443.094**	**19.85***	**1.0e+21**	**52.566***	**52.7706**	**54.0499**
8	**-**	**-**	**-123954***	**-**	**-**	**-**

Key:
* the selected lag
LR: Likelihood ratio
FPE: Final prediction error
AIC: Akaike information criterion
HQIC: Hannan Quinn information criterion
SBIC: Schwarz Bayesian information criterion

In the Johansen co-integration test, the variables must be non-stationary at a certain level, but after their conversion into first difference, they must be stationary (variables integrated to the same order). If the series becomes stationary (no unit root) after the conduct of the ADF test, this signifies the application of the vector auto regression (VAR) model. VAR captures the linear interdependencies among multiple time series, and each variable has a relationship that explains its existence based on its lags and those of the other variables.

T-stat < critical value implying that there is no co-integration

VECM is also a model used when co-integration exists among the differential series. This method can explain both short and long runs and also strong causality, whereas VAR can analyse only the short-run causality.

Granger causality is conceptually designed to detect the causal direction between two time series. It precisely detects the correlation between the current value of one variable and the past values of another variable.[26] According to the outcome of the analysis, the VAR model is suitable as the methodology to be employed in analysing the impact of petrol subsidy on the economic performance of Nigeria, with income as the dependent variable and petrol consumption and petrol subsidy as the explanatory variables.

[26] Song et al., 2008.

Chapter 5: Results

5.1 Result from International Comparisons

Compared to the major OPEC member countries as in Figure 10, Nigeria has the highest domestic pump price of petrol with an equivalent price of N65 per litre followed by Iran with N58.4 per litre (as indicated in Nigerian currency terms). This implies that Venezuela is among the countries with the highest subsidy support on local price of petrol in 2011 with a value of N5.84 per litre of petrol.

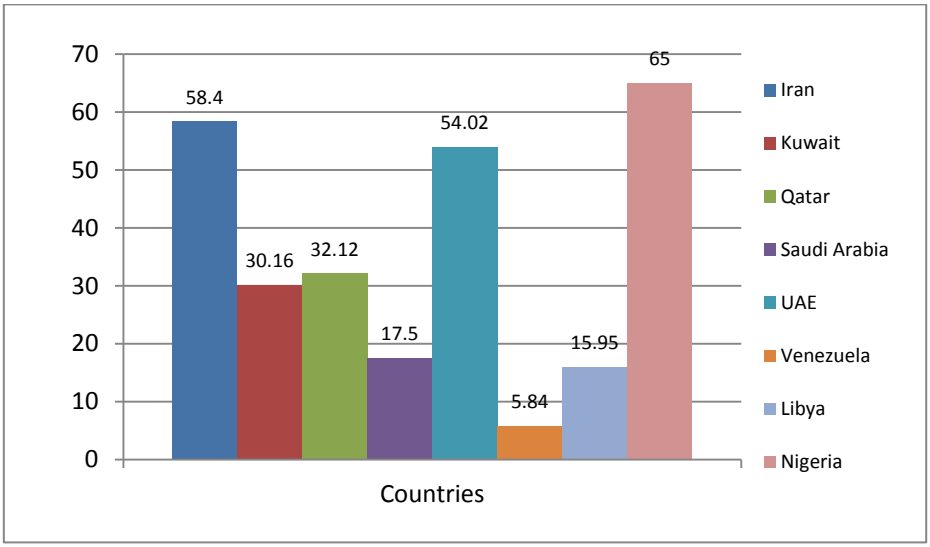


Figure 10: Pump Price per Litre of Petrol in Some Exporting Countries

Source: Adopted from Umukoro A. and Adeyemi A. (2011:50)[27]

Among the highlighted countries, Nigeria is considered to be having the highest proportion of subsidy funding from the national income as seen in

[27] Article titled "The Fallacy of Fuel Subsidy," *The Tell*, November 28.

figure 11.

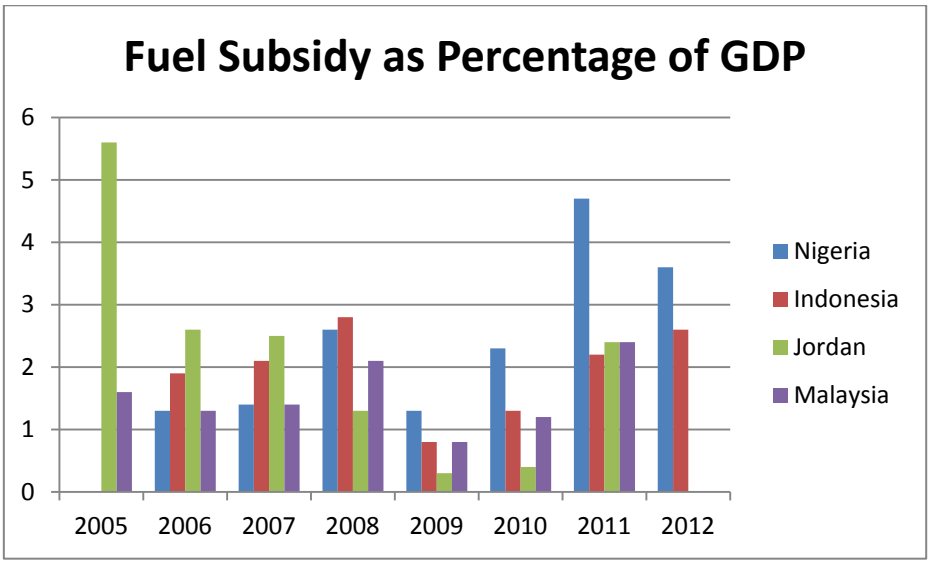


Figure 11: Comparison in terms of Subsidy proportions to GDP

Source: IMF 2013

5.2 OLS Regression Analysis

<u>Regression of Income (GDP) against Petrol Price, Subsidy, and Consumption</u>

To check the overall statistical significance of the estimation and explanatory variables, the income was regressed against the explanatory variables (domestic petrol price, petrol consumption, and petrol subsidy) using ordinary least squares (OLS) analysis.

A variable's significance is established by a "p>|t|" value less than 0.05 or a 5% confidence interval, and by a t-value greater than 1.76. Table 17[28]

[28] Refer to Appendix 1 for a more detailed results table.

explains the independent variables (R^2=.9306; F=98.27), demonstrating that an increase in petrol consumption (P<0.00; coeff=0.6879) has a positive impact on the national income. The result indicated that the t-value of 8.47 for petrol consumption makes it the only significant variable (also with a positive impact on income). If a 10% significance level will be considered, the petrol price can be said to have a significant positive effect on income, with a 1% positive change in price leading to an approximately N0.18 billion increase in the national income.

Table 17: OLS Regression of Y against PP, PS, and PC

LnY	Coeff.	Std. Err.	t	P>/t/	95% Conf. Interval	
LnPP	0.1861791	0.1063503	1.75	0.094	-0.034378	0.4067361
LnPS	-0.029846	0.1166003	-0,26	0.800	-2.716603	0.2119683
LnPC	0.6879071	0..812605	8.47	0.000	0.519383	0.8564311
Cons-tant	23.21727	0.2480537	93.60	0.000	22.70283	23.7317

R^2=0.9306

<u>Significant variable:</u> Petrol consumption (unit: billion litres). The estimated relationship is as follows:

$Y = 23.21727+0.6879071P_C+E_t$.

The results indicate that a 1% increase in the domestic consumption of petrol will lead the national income to increase by N0.69 billion. The other explanatory variables, namely petrol price (P>t=0.094) and petrol subsidy (P>t=0.800), indicate an insignificant effect on the national income because of their hypothetical values that are not within the probability boundary.

Referring to the multicollinearity result within the explanatory variables as in Table 18, indicates that the correlation values between income and petroleum subsidy and between income and petroleum consumption are 0.8069 and 0.9461, respectively. There is also a high correlation between petrol price and petrol subsidy (correlation value: 0.8582). These outcomes show that there is a need to conduct time series analysis to observe the variables' (petrol consumption and petrol subsidy) effects on income over time.

Table 18: Correlation Matrix of $Y = f(P_P, P_C, P_S)$

	LnY	**LnPP**	**LnPS**	**LnPC**
LnY	1.0000			
LnPP	0.5740	1.0000		
LnPS	0.8069	0.8582	1.0000	
LnPC	0.9461	0.4273	0.7384	1.0000

5.3 Time Series Analysis

Regarding the objective of this research, to analyse the impact of petrol subsidy on the economic performance of Nigeria, the national income variable is analysed with the petrol subsidy (per litre) provided by the government, and with the petrol consumption, to determine the effects over time (either in the short- or long-term effects).

The time series graphical trends on the path of the local (or pump) petrol price and the subsidy are similar, signifying that the local petrol price and subsidy have similar effects on the income (thus, the decision to consider only the petrol subsidy). The mere observation of the trends indicates the non-

stationarity nature of the time series graph of both petrol subsidy and petrol consumption (see Appendix 4).

Unit Root (Augmented Dickey Fuller) Test

As per the procedure described in the previous chapter for time series analysis, the t-statistic for income in Appendix 5 (t=0.183) is less than the critical value of 3.600; thus, the null hypothesis cannot be rejected at a 5% critical value, signifying that Y has a unit root or that its value is non-stationary.

H0: Y has a unit root (or Y is non-stationary).

H1: Y has no unit root (or Y is stationary).

Vector Autoregression (VAR) Test

Verifying the application of VAR in the unit root test shows the need to test for the existence of a causal relationship between income and the variables (petrol consumption and petrol subsidy).

The result on Table 19 indicated that there is unidirectional causality running from petrol consumption to income at a 95% confidence interval; thus, an effective increase in the domestic petrol consumption will lead to an increase in the national income. The result also indicated a bidirectional causality running from income to petrol subsidy at a 95% confidence interval.

Table 19: Vector Autoregression Result

Dependent Variable	Explanatory Variable	Z Value	P>/Z/	95% Confidence Interval
Y	Y	6.01	0.00	0.860813
	PC	2.41	0.016	2.78E+8
PC	Y	1.76	0.078	-1.46E-11
	PC	2.65	0.008	0.1644635
Y	Y	7.22	0.00	1.029384
	PS	1.06	0.287	-1.78E+8
PS	Y	2.00	0.046	8.01E-12
	PS	2.20	0.028	0.0535075
PC	PC	2.38	0.017	0.1027929
	PS	0.86	0.0391	-0.0797305
PS	PC	3.14	0.002	0.8365665
	PS	2.29	0.022	0.0679287

Granger Causality Test

In the Granger causality test, which is designed to detect the causal relationship between income and either petroleum consumption or petroleum subsidy, the existence of a time series relationship is determined by testing the current value of the income and either of the past variables of petrol consumption or subsidy, and as such, also consumption and subsidy. The result of this test is presented in Table 20 below, showing an L-R short-term unidirectional causality running from petrol consumption to income at a 10% confidence interval (P-value = 9.5%). The test result indicated a non-causality effect from subsidy to income or from income to subsidy. There is also unidirectional causality running from petrol subsidy to petrol consumption at

a 1% confidence interval (P-value = 0%) while there is no causality running from petrol consumption to subsidy.

Table 20: Granger Causality (Wald) Test Results

"From" Variable	**"To" Variable**	**Chi Square**	**Degree of Freedom**	**P-Value**
PC	Y	6.3736	3	0.095*
Y	PC	-	0	-
PS	Y	2.195	3	0.533
Y	PS	2.3679	1	0.124
PC	PS	2.4438	3	0.486
PS	PC	32.305	3	0.000***

Legend: * 0.10, ** 0.05, *** 0.01 (p-values within the parentheses)

Chapter 6: Policy Implications and Conclusion

6.1 Policy Implications

The petrol subsidy provided by the government influences the high consumption of the product due to its affordability by the dominant low- and medium-income earners. The national interest dictates that the country's economic performance be improved by subsidizing the petrol price, which will have a positive impact on the economy through its optimal consumption.

Subsidy removal will cause multiple increments in the petrol price, which will consequently lead to a decrease in petrol consumption and an increase in the prices of other goods and services as well as those in the transport sector (where petrol is the major driver). Forecasting a reduction in the estimated future consumption could be planned due to the expectation of higher demands.

The provision of alternative energy sources is another alternative or supplement for the control of carbon emission and the prevention of the depletion of the country's petroleum resources. It will also optimize energy consumption as a driver of economic development.

6.2 Conclusion

This paper addressed the downstream market of the petrol pump price and its relative consumption, with the aim of analysing the impact of petrol subsidy on the economic performance of Nigeria.

The data obtained indicate that more income can be generated through the domestic consumption of petrol (due to its lower price), which can be used to support the most vulnerable segments of the economy (due to the short-term negative impacts of the petrol price hike) that can hardly afford the price increments. Petrol subsidy has a significant influence on petrol consumption, which signifies that it has a positive effect on the national income (as petrol consumption influences income).

The study result shows that petrol consumption as a driver of economic development has a significant impact on the national income, thereby indicating that a decrease in the price of petrol (through subsidy provision) will also contribute positively to the economic performance of Nigeria. An alternative way for the government to boost the country's economic development is through the provision of alternate energy sources with relatively low tariffs through revenue diversification.

For the government to succeed in its push for the gradual removal of the petrol subsidy, the accrued funds from the subsidy withdrawal need to be used to address the country's critical infrastructural needs so as to help cushion the effects especially on the poor and low-income earners, who comprise the majority of the population. There is a possibility that the negative effects of petrol subsidy can be cushioned by using or importing more efficient vehicles, expanding and improving the public transportation schemes, encouraging industries to use higher-efficiency methods and to reduce their energy wastage,

and passing laws and regulations for efficiency standard improvement to suit the general living conditions.

6.3 Future Research Areas

This research can be expanded into an assessment of full subsidy removal by looking at the refineries' optimal performance to meet the domestic demand. This will cause petrol price decline due to the differential with the international price as it will be refined locally, thereby causing the exclusion of the importation and other transportation taxes.

The following basic reasons can thus be buttressed:

(1) The petrol price will decline because of domestic refining.

(2) The fund used in subsidizing petrol can be diverted to other sectors of the Nigerian economy for the sustainable growth and development of the country.

(3) Stabilizing the need to meet the domestic demand through domestic production and refining can be extended to the regional demand and supply.

References

1. Aborisade, F., 2011. The Fuel Subsidy Debate: Does President Jonathan Deserve to Continue to Rule?.
2. Akanbi T. A., Aworemi J. R. and Amoo R. O., 2013. The impact of downstream oil sector deregulation on petroleum products pricing and consumption in Nigeria. *Sky Journal of Business Administration and Management,* Vol. 1(4), pp. 33-39.
3. Central Bank of Nigeria. Statistical bulletin, vol. 17, Abuja; 2006
4. Ekine D. I., Okidim I. A., 2013. Analysis of the Effect of Fuel Subsidy Removal on Selected Food Prices in Port Harcourt, Rivers State Nigeria (2001-2012). *European Journal of Business Management,* v(4), pp. 27-31.
5. F Birol, A V Aleagha, R Ferroukhi, 1995. The Economic Impact of Subsidy Phase Out in Oil Exporting Developing Countries: a Case Study of Algeria, Iran and Nigeria. *Energy Policy,* 23(3), pp. 209-215.
6. Frank Asche, Gjelberg O, Volker T., 2003. Price Relationships in the Petroleum Market: An Analysis of Crude Oil and Refined Product Prices. *Energy Economics,* vol. 25, pp. 289-301.

7. Glasure, Y. U., Lee, A.R., 1997. Cointegration, error-correction, and the relationship between GDP and energy; the case of South Korea and Singapore. Resource Energy Econ. vol. 20, 17-25

8. Jennifer Ellis, P., 2010. *The Effects of Fossil-Fuel Subsidy reform: A review of modelling and empirical studies,* Geneva, Switzerland: The Global Subsidies Initiative.

9. Karekezi, S., 1994. Energy Policy Issues in Africa. *Resources, Conservation and Recycling,* Vol. 12, pp. 23-29.

10. King K., Deng A., Metz D., 2012. An Econometric Analysis of Oil Price Movements: The Role of Political Events and Economic News, Financial Trading, and Market Fundamentals. *Batew White Economic Consulting,* pp. 1-53.

11. Kojima, M., 2013. Petroleum Product Pricing and Complementary Policies. *Policy Research Working Paper.*

12. Kosmo, M., 1989. Commercial energy subsidies in developing countries: Opportunity for reform. *Energy Policy,* pp. 244-253.

13. Oliver Damette, M. S., 2013. Energy as a Driver of Growth in Oil Exporting Countries?. *Energy Economics,* Vol. 37, pp. 193-199.

14. Ovaga (PhD), Okey H., 2012. Subsidy in the Downstream

Sector and the Fate of the Masses in Nigeria. *Kuwait Chapter of Arabian Journal of Business and Management Review,* Vol.1 No. 6, pp. 15-34.

15. Oyedepo, Olayinka S., 2012. On energy for sustainable development of Nigeria. *Renewable and Sustainable Energy Reviews,* Vol . 16, pp. 2853-2598.
16. Chiou-Wei, Song Z., Chen C., Zhu Z., 2008. Economic growth and energy consumption revisited-Evidence from linear and nonlinear Granger causality. *Energy Economics, Vol* 30, pp. 3063-3076.
17. The Presidency, Federal Republic of Nigeria, 2013. *Subsidy Reinvestment and Empowerment Programme.*
18. Ukah O. C., 1999. An Empirical Analysis of the Impact of Gradual Withdrawal of Subsidy on Domestic Consumption of Premium Motor Spirit in Nigeria 1977-1999. pp. 86-104.
19. Widodo, T. Sahadewo, Gumilang A., Setiastuti S. U., Chaerriyah M., 2012. Impact of Fuel Subsidy Removal on Government Spending. *ERIA Research Project Report,* Issue 2011-17, pp. 173-206.

APPENDIX 1 Regression Results

Income (GDP) against petrol Price, Consumption and Subsidy

$LnY = a_0 + a_1 LnP_P + a_2 Ln\ P_C + a_3 Ln\ P_S + E_t$

```
. reg lny lnpp lnps lnpc

      Source |       SS       df       MS              Number of obs =      26
-------------+------------------------------           F(  3,    22) =   98.27
       Model |  4.13085944     3  1.37695315           Prob > F      =  0.0000
    Residual |  .308271027    22  .014012319           R-squared     =  0.9306
-------------+------------------------------           Adj R-squared =  0.9211
       Total |  4.43913047    25  .177565219           Root MSE      =  .11837

------------------------------------------------------------------------------
         lny |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnpp |   .1861791   .1063503     1.75   0.094    -.0343779    .4067361
        lnps |   -.029846   .1166003    -0.26   0.800    -.2716603    .2119683
        lnpc |   .6879071   .0812605     8.47   0.000     .519383    .8564311
       _cons |   23.21727   .2480537    93.60   0.000     22.70283     23.7317
------------------------------------------------------------------------------
```

$Y = 23.21727 + 0.6879071 P_C + E_t$

Correlation Matrix

i. $Y = f(P_P, P_C, P_S)$

```
. corr lny lnpp lnps lnpc
(obs=26)

             |      lny     lnpp     lnps     lnpc
-------------+------------------------------------
         lny |   1.0000
        lnpp |   0.5740   1.0000
        lnps |   0.8069   0.8582   1.0000
        lnpc |   0.9461   0.4273   0.7384   1.0000
```

APPENDIX 2 Lag Selection Criteria

$\mathbf{Y = a_0 + a_2 P_C + E_t}$

varsoc y pc, maxlag(8)

Selection-order criteria
Sample: **1994 – 2011** Number of obs = **18**

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-497.877				4.5e+21	55.5418	55.5555	55.6408
1	-447.859	100.03	4	0.000	2.7e+19	50.4288	50.4698	50.7256
2	-442.174	11.372	4	0.023	2.3e+19	50.2415	50.3097	50.7362
3	-438.555	7.2382	4	0.124	2.6e+19	50.2838	50.3793	50.9764
4	-436.268	4.5739	4	0.334	3.5e+19	50.4742	50.597	51.3646
5	-433.786	4.9633	4	0.291	5.0e+19	50.6429	50.7929	51.7311
6	-422.565	22.443	4	0.000	3.2e+19	49.8405	50.0178	51.1266
7	-407.975	29.18*	4	0.000	2.0e+19	48.6639*	48.8685*	50.1478*
8	.	.	4	.	-9226.08*	.	.	.

Endogenous: y pc
Exogenous: _cons

$\mathbf{Y = a_3 + a_5 P_S + E_t}$

varsoc y ps, maxlag(8)

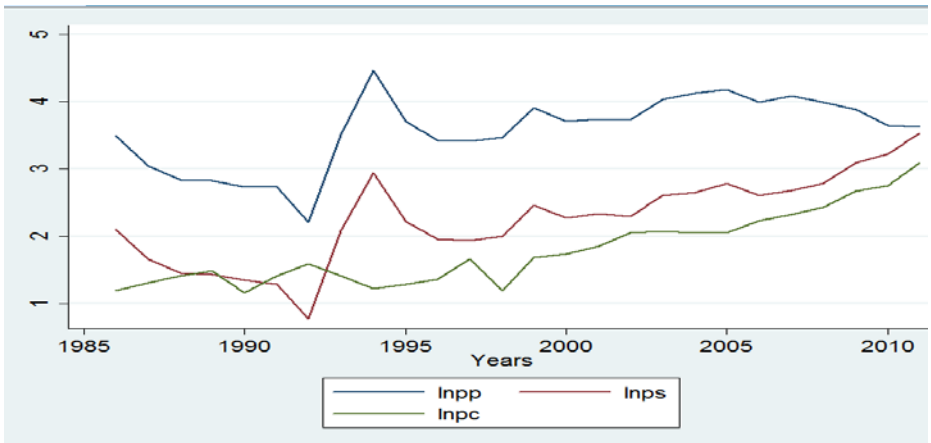
Selection-order criteria
Sample: **1994 – 2011** Number of obs = **18**

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-513.493				2.6e+22	57.277	57.2906	57.3759
1	-467.976	91.034	4	0.000	2.6e+20	52.6639	52.7049*	52.9607*
2	-465.042	5.8676	4	0.209	3.0e+20	52.7824	52.8506	53.2771
3	-462.575	4.9326	4	0.294	3.7e+20	52.9528	53.0483	53.6453
4	-458.724	7.7034	4	0.103	4.2e+20	52.9693	53.0921	53.8597
5	-457.943	1.5609	4	0.816	7.4e+20	53.327	53.4771	54.4153
6	-453.019	9.8493	4	0.043	9.6e+20	53.2243	53.4016	54.5104
7	-443.094	19.85*	4	0.001	1.0e+21	52.566*	52.7706	54.0499
8	.	.	4	.	-123954*	.	.	.

Endogenous: y ps
Exogenous: _cons

APPENDIX 3 Time Series Plot

PP, PS and PC (1986-2011)



APPENDIX 4 Unit Root Test (ADF)

Income (Y)				
Augmented Dickey-Fuller			No. of Observations = 22	
	T-Statistic	1% C.V.	5% C.V.	10%C.V.
Z(t)	2.212	-3.750	-3.000	-2.630
Mackinnon approximate p-value for Z9t) = 0.9989				

Petrol Subsidy (PS)				
Augmented Dickey-Fuller			No. of Observations = 22	
	T-Statistic	1% C.V.	5% C.V.	10%C.V.
Z(t)	1.054	-3.750	-3.000	-2.630
Mackinnon approximate p-value for Z9t) = 0.9948				

Petrol Consumption (PC)				
Augmented Dickey-Fuller			No. of Observations = 22	
	T-Statistic	1% C.V.	5% C.V.	10%C.V.
Z(t)	2.872	-3.750	-3.000	-2.630
Mackinnon approximate p-value for Z9t) = 1.0000				

APPENDIX 5 Johansen Cointegration Test

H0: There is no cointegration

Income (Y) against Petrol Consumption (PS)				
Johansen Cointegration Test			No. of Observations = 23,	
Max Rank	Parms	Eigenvalue	T-Statistic	5% C.V.
0	10	-	11.0451	15.41
1	13	0.38135	0.0000	3.76
2	14	0.00000		

Income (Y) against Petrol Subsidy (PS)				
Johansen Cointegration Test			No. of Observations = 23,	
Max Rank	Parms	Eigenvalue	T-Statistic	5% C.V.
0	10	-	5.4467	15.41
1	13	0.21086	0.0000	3.76
2	14	0.00000		

Petrol Consumption (PC) against Petrol Subsidy (PS)				
Johansen Cointegration Test			No. of Observations = 23,	
Max Rank	Parms	Eigenvalue	T-Statistic	5% C.V.
0	10	-	10.7389	15.41
1	13	0.26674	3.9134	3.76
2	14	0.16296		

APPENDIX 6 Granger Causality Test

Granger Causality of Income against Petrol Consumption

H0: All lag variables does not influence Y

Income (Y) against Petrol Consumption (PC)				
Granger (Wald) Test				
Equation	Excluded	Chi Squared	df	P>Chi2
Y	PC	6.3736-	3	0.095
Y	ALL	6.3736	3	0.095
PC	Y	-	0	-
PC	ALL	-	0	-

Granger Causality of Income against Petrol Subsidy

H0: All lag variables does not influence Y

Income (Y) against Petrol Subsidy (PS)				
Granger (Wald) Test				
Equation	Excluded	Chi Squared	df	P>Chi2
Y	PC	2.195	3	0.533
Y	ALL	2.195	3	0.533
PC	Y	2.3679	1	0.124
PC	ALL	2.3679	1	0.124

Granger Causality of Income against Petrol Subsidy

H_0: Petrol Subsidy can influence Petrol Consumption

Petrol Consumption (PC) against Petrol Subsidy (PS)				
Granger (Wald) Test				
Equation	Excluded	Chi Squared	df	P>Chi2
Y	PC	2.4438	3	0.486
Y	ALL	2.4438	3	0.486
PC	Y	32.305	3	0.000
PC	ALL	32.305	3	0.000

APPENDIX 7 Autocorrelation and Normal Distribution Test

H0: residuals are normally distributed

Y = f(PC)

```
. varlmar
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	1.3523	4	0.85245
2	2.1960	4	0.69976

H0: no autocorrelation at lag order

```
. varnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
y	60.371	2	0.00000
pc	0.541	2	0.76300
ALL	60.912	4	0.00000

Y = **f(PS)**

```
. varlmar
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	4.1412	4	0.38723
2	0.7368	4	0.94671

H0: no autocorrelation at lag order

```
. varnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
y	35.288	2	0.00000
ps	6.000	2	0.04979
ALL	41.288	4	0.00000

$P_C = f(P_S)$

varlmar

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	**2.1888**	**4**	**0.70109**
2	**2.6527**	**4**	**0.61752**

H0: no autocorrelation at lag order

varnorm, jbera

Jarque-Bera test

Equation	chi2	df	Prob > chi2
pc	**0.484**	**2**	**0.78490**
ps	**16.032**	**2**	**0.00033**
ALL	**16.516**	**4**	**0.00240**

APPENDIX 8: Stakeholder Analysis

S/NO	Stakeholders	Removal of Fuel Subsidy		Improved Capacity Utilization of Domestic Refineries	
		Position	Remark	Position	Remark
1.	Major Foreign Oil Producing Companies (Shell, Mobil, Chevron, Total E&P, NAOC/Phillips, Texaco, Pan-Ocean)	√	Would reduce local consumption and increase export to 'home' countries.	**X**	Would reduce export to 'home' countries.
2.	Foreign Nations (Major destinations of Oil Exportation): North America, Europe, Africa, South America and Asia	√	Would reduce local consumption and increase receivable crude oil.	**X**	Would reduce receivable crude oil.
3.	Foreign Nations (Major sources of fuel importation): Europe, Spain the Mediterranean, the Baltic, South Africa and West Africa (Ghana)	√	Would reduce their foreign earning from Nigeria, but would increase fuel availability in 'home' countries.	**X**	Would reduce demand from Nigeria - reduction of foreign earning from Nigeria.
4.	International Development Institutions (IMF and World bank)	√	Would reduce local consumption, increase availability of products in major funding countries.	**X**	Would reduce availability of products in the major funding countries.
5.	Major fuel importers: Mobil, NNPC Retail, Oando, Conoil, Total, African Petroleum and MRS Oil	**X**	Removal of subsidy would reduce their earnings.	**X**	Would reduce their earnings.
6.	Federal Government	√	Would increase disposable fund to other sectors/projects.	Δ	Would reduce expenditure on fuel subsidy but would adversely affect its relationship
7.	State Governments	√	May increase shareable fund from the federation account.	Δ	May increase shareable fund from the removal of subsidy.
8.	Civil servants and Corrupt elements in Government Agencies and Oil industry	**X**	Would reduce their earnings via rents, bribery, over-invoicing, theft or embezzlement.	√	Would reduce their earnings via rents, bribery or embezzlement.
9.	Distributors/Transporters/licensed Dealers of petroleum products	**X**	Would reduce their payback period and increase financial risk	**X**	Would reduce transportation risk since each would be dealing with the nearest refinery/depot, but reduce earning from PEF.
10.	Civil society Organizations/National Labour Congress	**X**	Would increase hardship for members, and they do not trust the government to use the fund that would be saved for the benefit of ordinary Nigerians.	√	Would reduce the cost of fuel and ejection of fund to improve the living standard of Nigerians. It would ensure availability of product.

Keys: **√=In favor X=Against Δ=Neutral.** Source: Centre for public policy alternatives, 2013

초 록

휘발유 보조금 폐지가 나이지리아 경제적 성과에 미치는 영향에 대한 계량 경제 분석

함자 알리우 다네지

협동과정 기술경영경제정책전공

서울대학교 대학원

나이지리아는질이좋은경질유자원을소유하며하루에2.5MMbbls 생산량이가진세계의원유수출국가(오펙멤버) 이다.원유는국가경제성장의대기부자이기도한다.남,북지역으로구성된나이지리아는 1억 7천만의인구를가지고있으며아프리카땅의대국중하나라고일컬을만하다.남부해안지역은 나이지리아의원유상품을산출하는곳이며수출터미널과정밀상품수입터미널도잘구비되어있다.나이지리아가원유를산출하지만국내수요에비해원유를정련하는능력이아직많이낮다는것은사실이다.

따라서정유수요의갭을메우기위해정유를수입할수없게되었다.결국, 균일한유가를유지하기위해정부가남부산지에서북방까지휘발유의운송비용에대한보조금을주기로하였다.동시에마케팅회사로수입한휘발유의가격은규정된가격보다훨씬비싸므로이가격차에대해서도보조금을주기로하였다.

원유 품질의 차의 증가에 따라 경유와 중유 상품의 가격갭도 심해진다. 석유 수출국가의 정부들이 세금수입의 포기금액은 약 전국의 석유수출액의 삼분의 일을 차지한다고 발표했다(Mark Cosmo, 1989). 그결과, 유가의상승에따라국가들이지원하는보상금액을올릴수밖에없고이정책을없애는데에도점점힘들어진다.

석유는 나이지리아 경제의 주요 기지국이다.(가장 귀중하고, 다용도하면서도 고갈 속도 빠른 비재생자원):

- 80년대부터 나이지리아의 외환수입의 97%차지

- 80년대에 국가 GDP 의 20%~25% 이상 차지하며 국가재정수입의 70% 차지

석유 보조금은 소비자들이 실제가보다 싼 시중가를 지불하여 휘발유 구매를 원하는 데에 존재한다. 1986 년 9 월에 효과가 보인 후에, 정부가 점차 보조금 정책을 철수하기로 하였다. 이 상황에도

불구하고, 대다수의 나이지리아 사람들은 하류 석유 생산 부분의 보조금 폐지를 외쳤다. 본 논문은 석유 보조금의 폐쇄로 인한 나이지리아 경제에 미치는 영향에 대한 분석을 하고, 석유 수요의 변화가 국가 GDP 을 미치는지도 분석하고자 한다.

본 논문은 다중 회귀계량경제법을 사용하여 수입은 유가와 유가 보조금, 그리고 경제성장에 긍정적인 영향을 미치는 소비량의함수로 삼아 경제 성장에 도움이 주는 석유 세금을 계산한다. 향후에는 시간에 따른 여러 가지 효과를 측정하기 위해 시계열분석방밥을 사용한 연구도 추가할 것이다.

다른 석유 산출국가의 성공적인 보조금 폐지 정책과의 비교를 통해 경제성과도 높일 수가 있다. 기타 석유 대체 자원에 대한 연구 정책은 경제 성장의 제고 효과가 있다. 뿐만 아니라 자원 방비에 대한 최소화 효과와 편의성으로 인한 탄소 배출도 효과가 있다. 결국 절약한 석유 자원은 미래에 증가된 수요에 만족시킬 수 있게 된다.

요약어: *나이지리아, 휘발유보조금, 계량경제학, 시계열분석, 영향, 경제성과*

학 번: 2012-22604

Master's Dissertation in Engineering

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

휘발유 보조금 폐지가 나이지리아 경제적 성과에 미치는 영향에

대한 계량 경제 분석

February 2014

Graduate School of Seoul National University

College of Engineering

Technology Management, Economics and Policy Program

Hamza Aliyu Daneji

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

지도교수 김태유

이 논문을 공학석사학위 논문으로 제출함

2014 년 02 월

서울대학교 대학원

협동과정 기술경영경제정책전공

Hamza Aliyu Daneji

함자 알리유 다네지의 석사학위 논문을 인준함

2014 년 02 월

위 원 장 ___김연배___(인)

부위원장___김태유___(인)

위 원 ___이현정___(인)

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

지도교수 김태유

이 논문을 공학석사학위 논문으로 제출함

2014 년 02 월

서울대학교 대학원

협동과정 기술경영경제정책전공

Hamza Aliyu Daneji

함자 알리유 다네지 의 석사학위 논문을 인준함

2014 년 02 월

위 원 장 _____(인)

부위원장 _____(인)

위 원 _____(인)

Abstract

Econometric Analysis on the Impact of Petrol Subsidy on the Economic Performance of Nigeria

Hamza Aliyu Daneji

Technology Management and Policy Program

College of Engineering

Seoul National University

Nigeria is one of the world's crude-oil-exporting countries (OPEC member) with light/sweet crude oil properties and a high volume of production (about 2.5 MMbbls/day).[1] Oil is the major contributor to the national economic growth. Nigeria has a population of about 170.1 million and is one of the most extensive countries in terms of areal size in Africa. It also consists of two major regions: North and South. The southern coastal region is the domicile of Nigeria's oil production and export terminals as well as its refined-product receiving terminals. Although Nigeria produces oil, its domestic refining capacity is by far lower than its domestic demand.[2] As a consequence, refined

[1] http://www.nnpcgroup.com/NNPCBusiness/UpstreamVentures/OilProduction.aspx

[2] Over 98% of the oil produced in 2009 was exported as Nigeria does not have the capacity to refine most of its crude oil (International Energy Agency [IEA], 2010).

petrol has to be imported to bridge the shortfall in the domestic supply.

Consequently, to ensure the uniform pump price of petrol across the country, the federal government subsidized the cost of the transport of petrol from the southern source area to the northern high-demand areas. The government also pays the cost differential of imported petrol to marketing companies because the landing cost is higher than the regulated pump price.

Along with the rapid increase in crude oil quality differentials also emerged a widening gap between the prices of light and heavy products.[3] The forgone revenue estimates in oil-exporting countries approximate one-third of all the oil export revenues (Cosmo, 1989). Thus, with the continuous rise in energy prices, the subsidies provided by the government will become even more costly and increasingly difficult to remove.

Oil, the main backbone of the Nigerian economy and one of the most valuable, versatile, and flexible non-reproductive, depletable natural resources:

- constituted 97% of Nigeria's foreign exchange earnings since the 80s; and
- accounted for just above 20-25% of the total GDP in the 1980s, and 70% of the budgetary revenue.

Oil subsidy exists when consumers would pay the market price per litre of petroleum product, less than the actual price. From September 1986, the

[3] According to Hossein Tahmassebi (May 1985), the difference between the spot prices for Middle Eastern heavy crude oil with an API gravity of 31°, and African light crude oil (37-40° API), which averaged only USD0.98 per barrel in 1972, jumped to USD2.67/b in 1974. The increase was even more pronounced during the 1979 crisis, when the gap widened from USD1.75/b in 1978 to USD5.03/b in the following year.

government decided to gradually withdraw its subsidy on petroleum products. Notwithstanding this situation, majority of the Nigerians continue to clamor for further subsidy removal in the downstream oil sector of the Nigerian economy. This research aimed to analyse the impact of petrol subsidy removal on the economic performance of Nigeria, and to determine if the petrol consumption (demand) affects the national income (GDP).

The analysis was conducted using the multiple regression econometric approach, with income being a function of the domestic pump price of petrol as well as petrol subsidy and consumption, which indicates that an increase in the consumption of petrol positively impacts economic growth, generating additional oil revenues that can be used to boost economic development. A further research was conducted using time series analysis to observe the effects of the variables over time.

Economic performance can also be enhanced through policy comparisons with other oil-producing developing countries that successfully adapted the full subsidy withdrawal scheme. Policies based on the further development of abundant alternative energy resources will broaden their availability and will boost the economic development. It will also minimize energy wastage and carbon emissions due to the availability of cheap oil, and will save enough oil to meet the future increases in the oil demand.

Keywords: ***Nigeria, petrol subsidy, econometric analysis, time series analysis, impacts, economic performance***

Student ID: 2012-22604

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations

CBN	Central Bank of Nigeria
IOC	International oil company
NNPC	Nigerian National Petroleum Corporation
OPEC	Organization of Petroleum-exporting Countries
PPPRA	Petroleum Product Pricing and Regulatory Agency
SAP	Structural Adjustment Programme
DPR	Department of Petroleum Resources
PMS	Premium motor spirit
NEITI	Nigerian Extractive Industries Transparency Initiative
NGC	Nigerian Gas Company
PEF	Petroleum Equalization Fund
GDP	Gross domestic product
OMC	Oil marketing company
OTC	Oil trading company
FOREX	Foreign exchange
NEC	National Energy Commission
ENAP	Empresa Nacional del Petroleo
DPK	Dual-purpose kerosene
AGO	Automotive gas oil

Chapter 1: Introduction

1.1 Background

Fossil fuel energy is the major tool for Nigeria's economic growth and development. It plays an important role in the nation's diplomacy and as a tradable commodity for income generation, to support the economic development. Nigeria is richly blessed with primary energy resources, endowed with the world's tenth largest reserves of crude oil, which is currently estimated to be about 36 billion barrels[4] (about 4.896 billion tons of oil equivalent in 2006). Globally, apart from its being the 14th largest producer of crude oil (index mundi) and having the 10th largest proven crude oil reserves, Nigeria also possesses the 8th largest proven reserves of natural gas.

According to Oyedepo (2012), energy, specifically oil and gas, continues to contribute over 70% of Nigeria's federal revenue for its national development programs, and crude oil has contributed an average of 25% to Nigeria's gross domestic product (GDP), the second highest contributor after crop production. As of 2005, the energy mix is dominated by oil, which accounts for about 57%, followed by natural gas (36%) and hydroelectricity (7%). The major driver of energy demand is the population, and the energy demand is determined by the level of economic activity and measured by GDP (Sambo et al., 2006).

There are four refineries with an installed capacity of 445,000 barrels of

[4] Oyedepo, 2012, pp. 2584-2587.

fuel per day. The country's industrial base is relatively low compared to the demand for fuel driven mainly by domestic consumption and transportation. The predominant determinants of the Nigerian energy consumption mix are petrol, kerosene, and diesel oil, with small amounts of other refined products being exported occasionally from the domestic refineries. Nigeria's daily energy consumption is considered low (109.5 kWh) relative to the proportional consumption of petrol fuel per 1,000 persons. This is indicated in Table 1.

Table 1: Petrol Consumption and GDP in Some Selected Countries

Country	Daily Energy Consumption (kWh/1000 persons)	Daily Petroleum Fuel Consumption ('000 barrels)	Petroleum Fuel Consumption (bbls/1000 persons)	GDP 2006 (USD billions)	Annual GDP Growth Rate % (2005)	Average Annual Growth (1990-2001)
Egypt	1276	538	7.61	107.18	4.96	4.5
Indo-nesia	496	1022	4.42	364.4	5.6	3.8
India	460	2000	1.91	906.26	9.23	5.9
S. Africa	5487	482	11.04	254.9	4.87	2.1
Nigeria	109.5	257	1.98	114.68	6.94	2.5
Ghana	301	31	1.53	12.9	5.9	4.2
Brazil	2006	2200	12.50	1067.96	2.3	2.8

Source: National Technical Working Group on the Energy Sector, Vision 2020 Report, 2009.

The total primary energy consumed in 2007 was 11.4 million tons of oil equivalent (MMTOE), with petroleum products having the greatest share (67.3%) of the total consumption, amounting to an average of 78.7% between 2002 and 2007 (Oyedepo, 2012).

As Nigeria is a net importer of fuel products (about 80%), the domestic consumers are subjected to price regimes in the international markets. The fuel supply is monopolized by NNPC and its subsidiaries. NNPC acts as the

regulator, distributor, competitor, and producer in the retail markets by licensing importers and distributors, fixing the local pump pricing, owning fuel stations and depots, and also administering the subsidy payments to the distributors. This led the Nigerian energy market to be classified as a regulated monopoly with a regulator, and also a competitor, in the energy market.

Fuel is considered an inelastic product from both the demand and supply sides, signifying that it is difficult for the consumers to find alternatives to the use of petrol, kerosene, or diesel due to the non-existence of electric train systems, solar heating, and cooking appliances. Also cooking gas is supplied in cylinders (lack of fully networked domestic gas distribution network), making it unaffordable to the poor, who make up 70% of the whole population.

The government adopted various economic measures[5] between 1982 and 1986, including the Economic Stabilization Act of 1982, the National Economic Emergency Act of 1985, and the Structural Adjustment Programme (SAP) of 1985, all aimed at long-term sustainable economic growth and development. The SAP was the most comprehensive reform programme in terms of scope, with four principal aims: trade liberalization, deregulation of the financial sector, rationalization and privatization of public sector enterprises, and adoption of appropriate pricing policies (by eliminating subsidies especially from petroleum products and public enterprises).

[5] G. Ugo Nwokeji, The Nigerian National Petroleum Corporation and the Development of the Nigerian Oil and Gas Industry: History, Strategies, and Current Directions, 2007, p. 14.

Deregulation of the Petroleum Industry

One of the pillars of the Transformation Agenda of the Federal Government is the progressive deregulation of the petroleum industry. In January 2012, the decision to remove the subsidy on premium motor spirit (PMS) or basically petrol was announced by the government, citing a number of major reasons for the need to institute the policy.[6]

First, the subsidy regime, in which fixed prices are maintained irrespective of the market realities, has resulted in a huge unsustainable subsidy burden and also the inability to make an impact on the intended beneficiaries. The subsidy level is directly correlated with the household income as richer households consume larger quantities of petroleum products. Consequently, the subsidy benefits mostly the rich. Another major challenge is that the subsidy administration is beset with inefficiencies, leakages, and corruption (both within the government and by the other stakeholders involved).

Petrol subsidy has resulted in the diversion of the scarce public resources from investment in critical infrastructure while putting pressure on the government resources. There is discouragement in terms of competition and stifled private investment in the downstream sector due to the low fund generation from the cheap price of petrol for the consumers. Due to the

[6] Adopted from Subsidy Reinvestment and Empowerment Programme (SURE-P), 2013.

absence of deregulation, investors have shied away from investing in the development of refineries, petrochemicals, fertilizer plants, etc. It is important to note that since the year 2000, the government has issued 20 licenses for new refineries, none of which has resulted in the construction of a new refinery.

The deregulation of the downstream sector of the petroleum industry will lead to rapid private sector investment in refineries and petrochemicals, which will generate millions of jobs and will lead to increased prosperity on the part of the people. The huge price disparity has encouraged the smuggling of petroleum products across the borders to the neighbouring countries, where the prices are much higher. Nigeria therefore ends up subsidizing the consumption of petroleum products in its neighbouring countries.

The government has, over the years (since 1986), progressed from the gradual lifting of the subsidy on petroleum products to the appropriate pricing stage, resulting in increases in pump prices, which greatly impact[7] the political economy of Nigeria.

The inability of the Nigerian industry to refine its crude oil has given rise to inefficiency due to the corporations' continuous selling of unrefined crude oil from the federal allocation in the international market since the 1980s, and due to the use of the proceeds to import refined petroleum products. According to the results of the NEITI audit in 2006, the domestic demand for

[7] Subsidy withdrawal may have both positive and negative consequences on the political economy.

PMS has risen so much that the existing refineries cannot meet it even if they produce at full capacity.

The Petroleum Product Pricing Regulatory Agency (PPPRA) came into being in August 2000 as an entity set up by the government to look into the downstream petroleum sector, which is characterized by the problems of scarcity of petroleum products leading to long queues at the various stations, low-capacity utilization and refining activities at the nation's refineries (poor state of refineries), rampant fire accidents as a result of the mishandling of products, product adulteration, pipeline vandalisation, large-scale smuggling due to unfavourable economic-product border prices for the neighbouring countries, and also to tackle the challenge of low investment opportunities in the sector.

Among the recommendations accepted by the government is the immediate setting up of PPPRA as an agency with sufficient autonomy to supervise the various phases of the proposal embodied in the report, especially the liberalization of the downstream sector of the petroleum industry.

1.1.1 Objectives of subsidy reform in Nigeria

The Nigerian government stated that its Medium-Term Fiscal Framework cannot work unless the fuel subsidy is scrapped, because the government needs N1.3 trillion savings for its critical infrastructure development projects.[8]

[8] Iyobhebhe, J. (2011). Removal of Fuel Subsidy in Nigeria: Issues and Challenges.

The removal will thus generate short-term pain due to the inflationary measures taken, but there may be much more long-term benefits as the market will self-regulate and the petroleum product prices will settle at the natural global market price. This will bring about more investment opportunities and an advantage for the commissioning of more private refineries.

The main reasons behind the fuel subsidy removal in Nigeria are as follows: to encourage foreign direct investment in the oil sector; to provide employment for the citizens; to improve education, health, power, water resources, and agriculture (Nwadibo, 2012); to boost the local refinery production; to reduce in the medium- and long-term importation of refined products; to gain more funds for local investment in the local sector; to help address the great imbalance between the recurrent and capital expenditure in Nigeria (Iyobhebhe, 2011); and to allow the government to gain access to more funds for public infrastructure development (Iba, 2012).

Many countries provide subsidies to some sectors (e.g., transport and agriculture) to enhance the economic activity and to curb inflation. Thus, the subsidy provision shields certain sectors from oil price increases (as a result, the demand in these countries failed to respond to the higher prices). In the countries with no subsidies, the demand for crude oil became stagnant or fell as the global crude oil prices climbed from 2007 to 2008. For the countries with subsidies, however, the demand was largely unresponsive to the price changes (as these political decisions maintained the artificiality of high demand). BP estimates that the countries with subsidies accounted for 96% of

the world's increase in oil consumption in 2007.

The effect of subsidy reform will vary depending on the reform process employed. Sudden price fluctuations tend to have the greatest impact on the low-income consumer groups. Price hikes will also translate into higher business input costs, with effects on sales, and eventually, profits. On the other hand, instituting a reform will result in financial savings, which can be used to support the negative effects of the reform on the consumers and businesses, redirecting savings into social welfare programs and other economic activities. For as long as the financial benefits are used to promote the consumers' and businesses' satisfaction, the resulting social impacts could be positive[9] (in achieving better socioeconomic outcomes than the subsidy regime).

1.1.2 Petrol pricing policy

The expected open market price (EOMP) is calculated as the sum of the landing costs (all the costs incurred until product purchase, including the production in foreign refineries, shipping, and port charges), the cost of distribution in Nigeria, and the various actors' profit margins, plus taxes (see Figure 1). As the government does not impose taxes on petrol, however, the current EOMP prices do not have any tax component. The government-approved retail price is set by the president, and there are no clear indices

[9] IISD, 2012.

determining such prices. The EOMP minus the government-approved retail price signifies the subsidy being funded by the government in the form of under- or over-the-cost recovery. The prices are not changed at fixed periods but are determined at different times by the president. Price increases are usually stiffly opposed by labour unions and citizens, often leading to compromises and lower price increases.

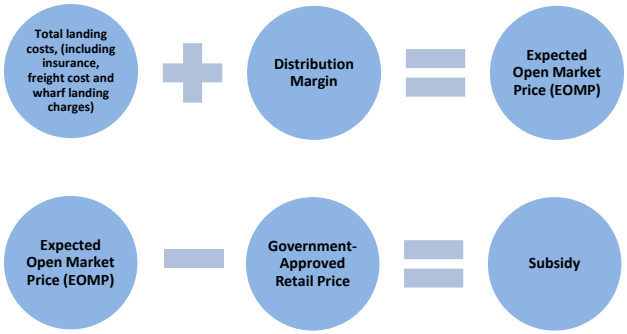


Figure 1: Components of PMS pricing and subsidy per litre.
Source: PPPRA Pricing Template for PMS, 2012.

1.1.3 Types of fossil fuel subsidies

Subsidy, as defined by the Organization for Economic Co-operation and Development (OECD, 2005), is "a result of a government action that confers an advantage on the consumers or producers to supplement their income or lower their costs." There are two main forms of subsidies[10]: (i) subsidies designed to reduce the cost of consuming fossil fuels; and (ii) subsidies aimed at supporting domestic fossil fuel production.

[10] Burniaux et al., 2009.

The consumers' subsidy is mainly intended to keep the fossil fuel prices low so as to stimulate certain sectors of the economy and to alleviate poverty by expanding the population's access to energy (Saunders & Schneider, 2000; Morgan, 2007). This is the main subsidy that is mostly used in non-OECD, former Eastern bloc, and developing countries. It takes the form of price control (IEA, 2007) and involves large price gaps mainly to subsidize transport fuel.[11]

Subsidies aimed at the producers are generally employed to keep the costs of production lower or to increase the revenues, and their effect is keeping the producers in business. These subsidies can also be motivated by the desire to reduce import dependency (European Environment Agency [EEA], 2004). The production subsidies are more common in developed countries than in developing countries.

1.1.4 Economic impacts of subsidy reforms

The outcomes of several global and single-country economic modelling studies on subsidy reforms suggested that on an aggregate level, the changes in the GDP are likely to be positive (Von Moltke et al., 2004). This is due to the incentives that resulted from the price changes, leading to more efficient resource allocation. This is evident in Figure 2, which shows similar petrol subsidy and GDP trends from 2007 to 2010 for Nigeria. The direct relationship means that the increase in subsidy (equivalent to more fund

[11] IEA, 2007.

allocation by the government to support price increase) positively influences the GDP. Thus, there is a possibility of economic development through greater consumption due to the lower price, although this has to be further investigated.

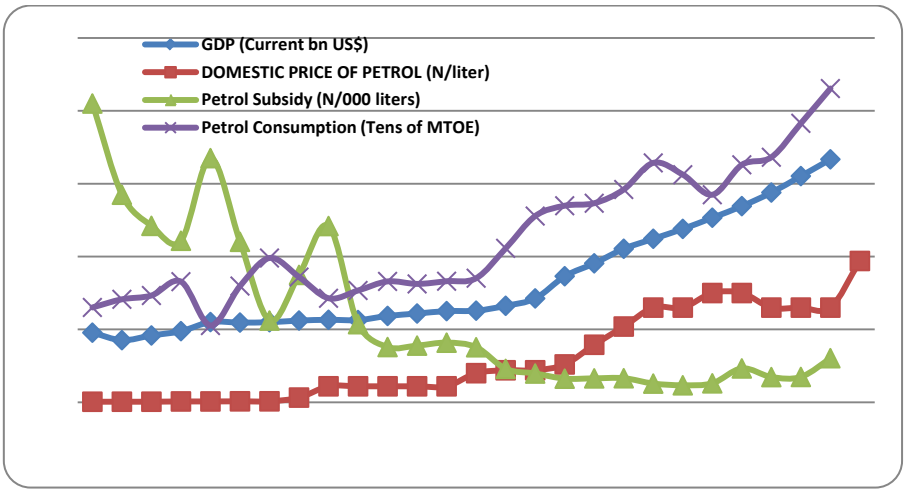


Figure 2: Domestic petrol price and consumption trends.
Source: PPPRA Nigeria and Min. of Petroleum Resources, 2013.

There exist terms of trade effects as resources are deployed productively across countries. “Terms of trade” refers to the ratio of the price that a country receives for its exports to the price that it pays for its imports, expressed in percentages. Improvement in the terms of trade of a country improves its social welfare. Removing taxes in oil-importing countries implies a terms-of-trade gain that comes as part of the gain from the subsidy reform. Oil-producing countries record terms-of-trade gains from removing taxes in

OECD countries, and large terms-of-trade losses from removing subsidies.[12] In addition, Burniaux et al. (1992) noted interesting but temporary terms-of-trade losses in oil-producing countries from delaying the depletion of reserves.

Eliminating subsidies also lowers the government expenditure as it is assumed by some studies that the government savings will be translated into improved social programs. It is also assumed that the economic gains from subsidy reform will be higher in non-OECD countries (Von Moltke et al., 2004).

The prices of petroleum products are uniform and controlled by the government (with frequent adjustments). The petrol price in Nigeria was N65/litre between August 2005 (USD0.50) and December 2011 (USD0.41), except in 2007 and 2008, when it was raised to N75/litre for a month and then lowered to N70/litre. On January 1, 2012, the Nigerian government removed the petrol subsidy and allowed the price to rise above N140 (USD0.88)/litre, but due to the widespread protests, it was lowered to N97 (USD0.61)/litre (representing a 49% increase from the price in 2011). On the other hand, the diesel prices have been deregulated for several years. The price of kerosene was made about one-third of the market price (highly subsidized) to help the majority poor households with their lighting and cooking demands.

Table 2 indicates the cost components that are added to the EOMP of petrol and the subsequent funding as subsidy support by the government in the form of under- or over-the-cost recovery (to bring the cost down to the level

[12] Ellis, J., 2010.

of the local pump price).

Table 2: Components of Petrol Price per Litre

Cost Element	USD/MT	Naira/Litre	
Landing cost	1,059.90	125.6	Actual importation cost of petrol
Distribution margins	130.72	15.49	Costs due to the retailers, transporters, and dealers
EOMP (1+2)	1190.62	141.09	Actual selling price without subsidy
Under/overrecovery	(372.07)	(44.09)	Government's subsidy to bridge the pricing to local sales
Retail price (3+4)	818.55	97	Domestic pump price of petrol

Source: PPPRA Nigeria, 2013

The domestic price of petrol has been increased over time by successive governments, as shown in Table 3; this is to bridge the high margin with the international price. These increases in the pump price per litre of petrol are automatic due to the gradual removal of subsidy funds, aimed at reducing the government's budgetary expenses, which becomes highly unsustainable. Nevertheless, the domestic petrol price in Nigeria is the highest among the world's oil-exporting countries (Ovaga, 2012).

Table 3: Price of PMS from 1986 to 2012 (N/Litre)

Year	Price per Litre (N:k)	Fluctuations	Comments
1986	0.395	-	Subsidy withdrawal began as SAP was introduced
1987	0.42	Increase	SAP implementation
1988	0.60	Stable	
1989	0.60	Stable	
1990	0.60	Stable	
1991	0.70	Increase	President Babangida
1992	0.70	Stable	Change in new government's policy (Shonekan)
1993	3.25	Increase	
1994	11.0	Increase	New military regime (Gen. Abacha)
1995	11.0	Stable	
1996	11.0	Stable	
1997	11.0	Stable	
1998	11.0	Stable	
1999	20.0	Increase	New regime (Abdussalami)
2000	22.0	Increase	New PPPRA and policy
2001	22.0	Stable	
2002	26.0	Increase	
2003	39.50	Increase	
2004	52.00	Increase	
2005	65.00	Increase	
2006	65.00	Stable	PSF to stabilize prices
2007	75.00	Increase	Global oil price hike
2008	75.00	Stable	
2009	65.00	Decrease	Due to public outcry
2010	65.00	Stable	
2011	65.00	Stable	
2012	97.00	Increase	Commencement of phase removal of subsidy

Source: PPRA and NBS (as cited by Ogunleye and Ayeni, 2012).

Among the major OPEC member countries, as shown in Figure 3, Nigeria has the highest domestic pump price of petrol, with an equivalent price of N65 per litre, followed by Iran, with N58.4 per litre (as indicated in Nigerian currency terms). This implies that Venezuela was among the countries with the highest subsidy support for the local price of petrol in 2011, with a value

of N5.84 per litre of petrol.

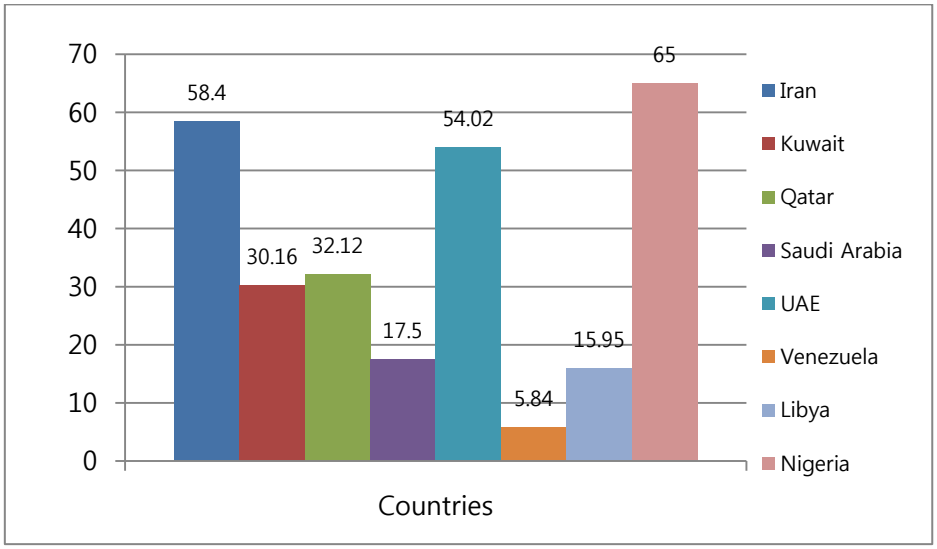


Figure 3: Pump price/litre of petrol in some oil-exporting countries.
Source: Adopted from Umukoro A. and Adeyemi A., 2011, p. 50.[13]

Petroleum Support Fund

The Petroleum Support Fund (PSF) is a pool of funds budgeted by the government to stabilize the domestic prices of petroleum products against the volatility in international crude oil and product prices. In an attempt to stabilize the domestic petroleum products' prices and to mitigate the associated problems, the government established PSF, which is in effect an interventionist fund, in January 2006. This is to attract more participation in product procurement without the hindrance of full cost recovery, which could arise in the event of an upward pressure on crude oil and product prices; to guarantee effective product supply and distribution to every nook and cranny

[13] Article titled "The Fallacy of Fuel Subsidy," *The Tell*, November 28.

of the country; and to increase the local production of products through investment in the establishment of local refineries.

In administering the fund, the pricing policy of PPPRA, which is based on the import parity principle, will be upheld. The import parity principle is used so that the concept and process of deregulation, which are the building blocks for massive investment in the economy, will not be totally expunged in the scheme of things. CBN is the custodian of the fund while PPPRA administers it. Claims from or payment into the fund will be subject to the duly verified volume of products lifted out of the approved depots to the retail outlets and sold in line with the recommended open market prices. The PSF implementation involves three phases of fund application: under-the-cost recovery, involving the payment from the fund to the marketers during the period of under-the-cost recovery, which applies when the landing cost of the products based on the import parity principle is above the approved PPPRA ex-depot benchmark; full cost recovery, in which no payment is made to the marketers if the landing cost of the products based on the import parity principle is equal to the approved PPPRA ex-depot benchmark as this reflects full cost recovery to the operators; and over-the-cost recovery, in which payment by the marketers to the fund on over-the-cost recovery applies when the landing cost of the products based on the import parity principle is below the approved PPPRA ex-depot benchmark.

1.1.6 Social protection

Due to the prior removal of the gasoline subsidy in January 2012, the government developed the Subsidy Reinvestment and Empowerment (SURE-P) Program, with the following three main objectives: (i) to mitigate the immediate impact of subsidy removal; (ii) to accelerate the economic transformation by investing in critical infrastructure; and (iii) to lay the foundation for a national safety net program.

The social protection mechanisms under the SURE-P Program include maternal and child health services, public works for women and youth, urban transport development, and vocational training.

The major terms of its reference are to determine, in liaison with the Ministry of Finance and Ministry of Petroleum Resources, the subsidy savings estimates for each preceding month, and to ensure that such funds are transferred to the Funds' Special Account with the Central Bank of Nigeria; to approve the annual work plans and cash budgets of the various project implementation units (PIUs) within the ministries, departments, and agencies (MDAs), and to ensure the orderly disbursement of funds by the PIUs to certify and execute projects; to monitor and evaluate the execution of the funded projects through a periodic Poverty and Social Impact Analysis (PSIA), among other methods; to update the president regularly on the programme; to periodically brief the Federal Executive Council (FEC) on the progress of the

programme; and to appoint consulting firms and external auditors of international repute to provide technical assistance to the committee in terms of financial and project management.

1.1.7 Consequences of subsidies

Fuel subsidies increased sixfold in the local currency between 2006 and 2011, and surpassed USD11 billion in 2011, constituting 4.7% of the GDP, as indicated in Table 4. It has become a huge burden that the funding is almost unsustainable compared to the infrastructural budget proportions, and primarily does not impact the low-income and poor people, who comprise the majority of the population. This gave rise to a more concrete reason for the government to implement subsidy removal initiatives as a way forward.

Table 4: Monetary Proportion of Subsidy on Nigeria's GDP

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
USD billion	2.0	2.3	5.4	2.7	5.3	11.4
% of GDP	1.3	1.4	2.6	1.6	2.3	4.7

Sources: IMF for 2006-2010; Central Bank of Nigeria for 2011.

It is quite unusual to have a market with deregulated diesel and regulated petrol prices, leading to a much greater apparent consumption of petrol than diesel. According to the EIA data, the petrol-to-diesel consumption ratio increased from 2 in 2000 to 7 in 2010. The major illegal petrol markets in

Nigeria engage in product adulteration, diversification of subsidized petrol into storage for selling at a later time, when there is a price hike, out-smuggling to the neighbouring countries, and presenting subsidized petrol as having just been imported to claim the subsidy reimbursement for the second time. The scale of corruption also debunks the government's argument that the savings from subsidy removal can be used more productively and equitably.

The subsidy withdrawal by the government affects the stakeholders involved either in a positive or negative way. Appendix 8 shows the results of an analysis of the parties involved, with the corresponding remarks on their performances. Another improved-refinery-utilization scenario provides a similar remark about the stakeholders.

1.2 Research Objectives and Questions

Due to the import of refined petroleum products at higher prices and to their domestic sale at discounted rates to satisfy the majority poor or low-income earners, and to the increases in the demands for petrol and kerosene, which largely affect the government's budget, the Nigerian government decided to remove its subsidy on petrol and kerosene so that it could channel the funds towards its other development projects.

The objective of this study was to investigate the impact of petrol subsidy withdrawal on the economic performance of Nigeria. The research questions for this study seek to determine the influence of petrol price increments (due to subsidy withdrawal) on the domestic consumption (demand) and the

resultant effect on the country's economic growth (GDP), as follows:

(1) What is the impact of petrol price subsidy on the economic performance of Nigeria (GDP)?

(2) What is the relationship between consumption and income?

Research Hypotheses

- Petrol subsidy has a negative effect on economic performance.
- Income has a positive effect on consumption.

Research Motivation

Nigeria has the highest population (about 170.1 million)[14] and is one of the most extensive countries in terms of areal size in Africa. The country consists of two major regions, North and South. The southern coastal region houses Nigeria's oil production and export terminals as well as its refined-products receiving terminal, while the most populous region, the northern region, is landlocked in the hinterland. Although Nigeria produces oil, its domestic refining capacity is by far lower than its domestic demand. As a consequence, refined petrol has to be imported to bridge the shortfall in the domestic supply. Consequently, to ensure the uniform pump price of petrol across the country, the federal government subsidized the cost of petrol transport from the southern source area to the northern high-demand areas.

[14] Nigeria Demographic Profile 2013 <www.indexmundi.com,nigeria/demographics_profile.html>.

The government also pays the cost differential of imported petrol to the marketing companies because the landing cost is higher than the regulated pump price.

The estimates of the foregone revenues in the oil-exporting countries due to subsidy implementation approximate one-third of the export revenues.[15]

According to Jensen and Tarr (2002), on subsidy reform in Iran, as the demand declines and the exports increase, the outputs of the energy-intensive sectors decline by 25-65%, and the activity in farming, food production, and other services increases.

Clements et al. found that a reduction in the subsidy in Indonesia increases the production costs, leading to price increases in other sectors (energy-intensive), which in turn reduce the overall consumer product demand. In turn, the production is decreased, leading to a lower demand for labour and lower capital inputs, household incomes, and consumer demand.

This research also analysed the impact of petrol domestic price increments on the economic performance of Nigeria as one of the major oil-exporting developing countries with a very low domestic petrol price in the past, and due to the fact that fuel subsidy is the major political and economic issue that is currently being discussed and debated on by the majority of the poor Nigerians. The analysis covers the period from when subsidy withdrawal began (1986) to 2012 so as to capture its reflection on the national incomes during such period.

[15] Kosmo, 1989, p. 244.

Chapter 2: Nigeria's Petroleum Industry

2.1 Nigerian Economy

The Nigerian oil industry remained entirely in the hands of IOCs to control the prices of the refined petroleum products in the domestic market, the collection of fees for exploration licenses and production leases and also of taxes and royalties from crude oil throughout the 1960s, until the Nigerian National Petroleum Corporation (NNPC) came into existence in 1977 to manage the country's interest in the oil industry.

Nigeria's entry into OPEC in 1971 led to the policy of requiring all investments in the economy to have a minimum of 60% Nigerian equity participation (as OPEC required its member states to nationalize their oil industry).

2.2 Downstream Petroleum Regulatory Framework

The Nigerian oil and gas industry is mainly divided into three major sectors: the upstream, midstream, and downstream sectors. The downstream sector of the industry refers to the refining of petroleum and the processing and purification of raw natural gas, and to the marketing and distribution of the products derived from petroleum and natural gas. The downstream sector touches the consumers through products such as petrol, kerosene, and diesel, and other processed petroleum products, natural gas, and petrochemicals. Midstream operations are often included in the downstream category, and are

considered part of the downstream sector, along with the major agencies, as indicated in Figure 4.

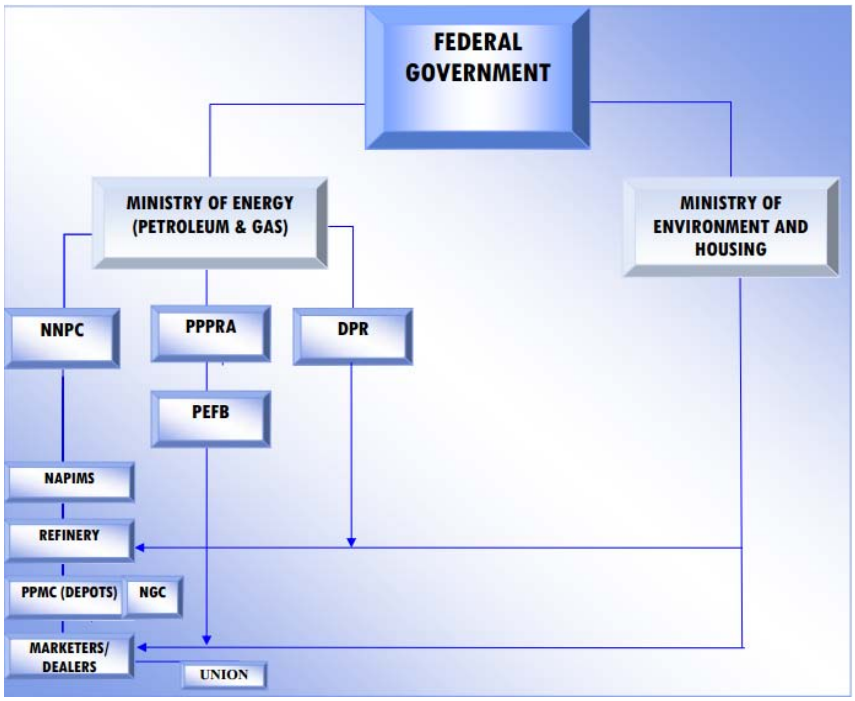


Figure 4: Structure of Nigeria's petroleum downstream industry.

Source: Agusto & Co.

Ministry of Energy (Petroleum and Gas)

All the agencies involved are under the umbrella of the ministry, which acts as the central nervous system, coordinating all the industry's activities on behalf of the government. In short, NNPC consists of NAPIMS, PPMC (mainly the depots), the refineries (as there is no private refinery but only refineries with purely federal investment), and the petroleum marketers. PPPRA manages PSF, established in 2006 to stabilize the domestic fuel prices.

Central Bank of Nigeria acts as the custodian of the fund. The pricing template uses the principle of under-the-cost recovery for reimbursement and over-the-cost recovery for payment into the fund, based on the international costs, charges, and controlled profit margins. Thus, PPPRA approves the import quotas for petrol and the eligibility for subsidy reimbursement while the Petroleum Equalization Fund (PEF) Management Board equalizes the transportation costs for pan-territorial pricing. DPR was established solely to oversee the activities in the oil and gas industry, but it is also under the Ministry of Petroleum Resources, for monetization.

Department of Petroleum Resources (DPR)

DPR, as an inspectorate, is an arm of the Federal Ministry of Petroleum and Mineral Resources. Section 10 of the NNPC Act provides for the establishment of the Petroleum Inspectorate (DPR), which shall be an integral part of the corporation. To this effect, DPR's responsibilities include the issuance of permits and licenses for all activities connected with petroleum exploration, production, refining, storage, marketing, transportation, and distribution when the specifications have been verified.

The enforcement of the stipulated price regime is based on the approved benchmark prices in collaboration with PPPRA and obliges the submission of all the necessary information and data relating to product procurement, supply, and distribution (for both import and local products).

DPR acts as an agency for the enforcement of the provisions of the

Petroleum Act, NNPC Act, or any other relevant law, and also to collaborate with PPPRA and PEF on intelligence monitoring to check malpractices. There are many instances, however, when their responsibilities overlap with those of PPPRA[16], engendering the issuance of policies by both bodies on the same issues. There is a continuous emphasis by the industry players on harmonizing these bodies or on clearly defining and delineating their responsibilities.

Petroleum Product Pricing Regulatory Authority (PPPRA)

This agency came into being from a special committee that was set up to review the Petroleum Product Supply and Distribution (SCRPPSD) drawn from various stakeholders and other interest groups to look into the problems of the downstream petroleum sector. Before the establishment of PPPRA, the downstream sector was characterized by the pseudo-scarcity of petroleum products leading to long queues at the service stations; low capacity utilization of the countries' refineries resulting from the poor state of the country's refineries; rampant fire accidents resulting from the mishandling of products, pipeline leakages, and vandalisation; smuggling of petroleum products to the neighbouring countries due to the subsidy on petroleum products; and also the low investment opportunities in the sector.

PPPRA was given the responsibilities of planning and programming the receipt and distribution of petroleum products to ensure uninterrupted product availability in the country based on the determined petroleum product supply

[16] Agusto & Co., 2008, p. 21.

gaps. The agency's staffs are also deployed to monitor and verify the data on product reception and distribution at the jetties, refineries, and depots nationwide. The creation of an information databank through liaison with all the relevant agencies makes it possible to facilitate informed and realistic decision-making on pricing policies.

PPPRA must collaborate with DPR with regard to the adherence to the product specifications and HSE standards; with PEFMB and other stakeholders with regard to the product movements to ensure efficient product supply and distribution to every part of the country; and also with CBN/FMF with regard to data exchange, FOREX allocation, and reconciliation. The necessity of embarking on a wide publicity and enlightenment programme to educate the stakeholders and the public at large on the benefits of the initiative (PSF) paved the way for the establishment of PPPRA, which has the ability to carry out such programme.

Security of supply is provided through collaboration with NNPC and other marketers to convince the latter to release their reserved stocks into the market in the event of emergencies and supply gaps arising from the inability of the marketers to fulfil their obligation of product procurement, and from shortfalls in refinery production.

Petroleum Equalization Fund Management Board (PEFMB)

PEFMB was established to equalize the transport cost arising from the distribution of petroleum products to all parts of the country — i.e., the cost of transporting petroleum products from the depot (source) to the point of sale.

This is to ensure that petroleum products will be made available in the country's retail outlets at uniform prices, and to prevent petroleum product shortage. Following the partial deregulation of the industry, the board is responsible for both the petroleum product equalization scheme and the bridging scheme.

The equalization scheme is intended to entrench the governmental policy of uniform pricing for petroleum products nationwide while the bridging scheme is designed to minimize or eliminate scarcity of petroleum products in the parts of the country that experience shortages. Shortages arise when the depots serving the area are dry due to the vandalisation of the pipelines or the closure of the refinery supplying them due to turnaround maintenance (TAM). The equalization scheme considers the following oil products: premium motor spirit (PMS), also known as petrol; dual-purpose kerosene (DPK); and automotive gas oil (AGO) or basically diesel.

Price Equalization Scheme

Marketers with outlets located close to depots contribute to PEF while those marketers whose outlets are located farther away from the depot claim from the fund. The identification of contributions and claims is done in a scientific way, although the parameters, such as the transport differential zones (TDZs), zonal transport zones (ZTRs), and national transportation averages, are considered. The depot district is the area of the country served by a depot, which is determined by the geographic location of the depot.

The national transportation average is the standard transport cost that the consumers of petroleum products pay all over the country. It is the cost that is sufficient to transport a litre of petroleum products from one zone to another (maximum of 100 km apart). It is included in the uniform price of the product. It is arrived at after considering the cost of the trucks, the compensation to be given to the truck owners for maintenance, the fees for the drivers and their assistants, the cost of the fuel and lubricants, the payment for the insurance, and the return on investments.

Central Bank of Nigeria (CBN)

According to the 2007 Act, CBN, the financial regulatory authority, is charged with the overall control and administration of federal government's financial sector policies, issuing a statement of account of the fund to PPPRA on a monthly basis, and issuing of FOREX to importers subject to the prevailing import procedures/guidelines of CBN. All the disbursements of the FOREX to oil product importers and also the debits from the marketers' accounts are accounted for monthly and rendered to PPPRA to enable maximum returns and to achieve fund accounting security.

Oil Marketing/Trading Companies (OMCs/TCs)

(1) Import, supply, and distribute petroleum products nationwide.

(2) The oil marketers are meant to comply with the rules and regulations set by PPPRA concerning product scheduling, shipment to jetties, product

transport through the pipeline network/trucks/rail to storage depots, and evacuation to retail outlets.

(3) Submit on a monthly basis the data on product supply and distribution.

(4) Allow PPPRA operatives to monitor the product movements from the jetties to the depots and from the depots to the retail outlets.

(5) Furnish PPPRA with three spiral-bound copies of the import documents sequentially arranged as prescribed in the checklist in Appendix II.

The Nigerian Case on Petrol Subsidy

The Nigerian case is that of the imposition of a consumer subsidy. This translates into a consumer surplus whereby the consumer pays for fuel at a price of N65 per litre, which is less than the current world market price of imported fuel inclusive of the distribution cost of N142 per litre. The consumer benefits by also purchasing the commodity/product in quantities that are at variance to the ideal quantities to be demanded by the consumer public. The supplying community (oil marketers) enjoys the producer's surplus as they are now inclined to sell larger quantities at the market price. These benefits from the subsidy are in some sense equally shared by the producer and consumer communities, the snag being that the consumer surplus is shared by a fairly large population of fuel consumers while the producer surplus is split amongst a smaller community of the importing community in Nigeria.

Structure of Petrol Subsidy in Nigeria

The petrol subsidy is provided in two ways: (i) when the distance from the port of importation (in this case, Lagos) to the region of consumption exceeds 400 km, then there is subsidy provision to the marketers to cover the transport cost; and (ii) to the pump price, to make it uniform in accordance with the government's decision to reduce the high cost impact on the low-income consumers. Thus, the amount of subsidy equals the differential between the consumer pump price and the international cost of importation or domestic production.

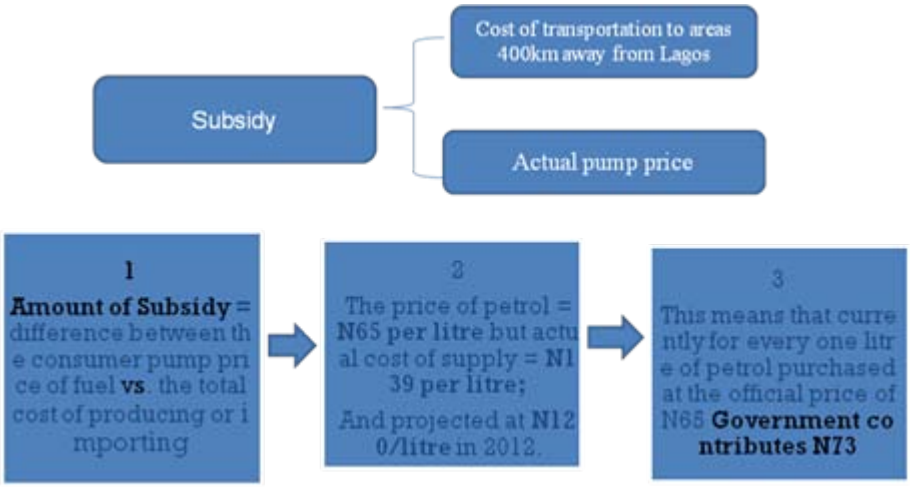


Figure 5: Structure of petrol subsidy in Nigeria.
Source: MPR Nigeria, 2013.

The economic theory postulates that the actual cost of subsidies exceeds the transfers offered by the government to the producer and consumer community. There is a notion of a residual portion that accounts for the opportunity cost of the inefficient allocation of resources by both the

consumer and supplier. This residual is identified as the dead-weight burden borne by the society and thereby has considerable social welfare implications when the possible opportunity cost of corruption borne by the society is factored.

The Nigerian situation is somewhat peculiar and manifests itself in a rather intriguing way that almost hints at the notorious Nigerian factor. This producer surplus in Nigeria should be redefined as an importer surplus in the sense that with the exception of NNPC, an indigenous operator in Nigeria, the other beneficiaries of this surplus are the foreign suppliers of refined products. Besides, NNPC's role in this regime is primarily that of an importer of refined fuel.

This is contrary to the theory that assumes that the supplying community is predominantly indigenous, and that even if the production is inefficient, this surplus should at least be enjoyed in the home country if the productive capacity exists. The imposed price control and mode of regulation in Nigeria discourages the local refining of crude oil, and it is technically and almost effortless to import fuel. The disincentives are exacerbated in the manner in which NNPC imports fuel: in the form of swapping a barrel of crude oil for an equivalent barrel of refined products. This roughly translates into the ratio of a barrel of crude oil to half a barrel of gasoline, a level of supply that exceeds the domestic consumption rate. This excess supply fuels the black market transactions between Nigeria and its neighbouring countries as well as the subsidy market, and a low-risk enterprise involving selling to the importer is

virtually guaranteed. This situation gives further insight into why the fuel business is perceived as a very lucrative source of livelihood for the privileged group of importers but certainly a loss to the society.

There is certainly a case for the removal of subsidies in Nigeria. Nigeria currently does not meet any of the listed criteria in the framework adopted in a UNEP 2003 study on energy subsidies that would justify the continued imposition of a subsidy.

Table 5: Factors for Subsidies' Critical Success

Criteria Specifics	**Nigeria**
Well targeted: The targeted beneficiary group should be able to receive the subsidies.	The transmission effect is distorted. The major beneficiaries are the importing community and the high-income petrol users.
Soundly based: Must be rationalized based on the results of well-thought-out research	No evidence that this thought process was put in place at the inception of this concept (There might have been the mindset that oil-producing countries could achieve populist gains through fuel subsidy.)
Transparent: The public must have access to the full cost of the subsidy.	Not transparent: The actual cost of the subsidy is not easily accessible in the public documents generated by the key government agencies involved in such exercise, namely PPRA, DPR, NNPC, and CBN.
Efficient: Should not undermine the incentives to efficiently allocate resources	The current system encourages excessive consumption and supply by both the consumers and the producers.
Practical: Must be affordable and must be administered in a cost-effective manner	The financing of the current program is not sustainable, especially when the price of crude oil rises in the world market.
Time-limited: Subsidy programs should be time-limited to eliminate an unhealthy dependence on subsidies either by the consumers or the producers.	Subsidy imposition has a long history in Nigeria, spanning three decades.

Source: CPPA, 2012

Effect of Subsidy on the National Budget

Subsidy funds can otherwise be used for many other pressing social and infrastructural development projects in sectors like health, education, power supply, and roads. As indicated in Figure 6, in the 2011 budget, the payment for the subsidy for the energy sector surpassed the capital expenditure by close to N200 billion. This shows that the funds available to the federal government for fuelling economic development projects are insufficient.

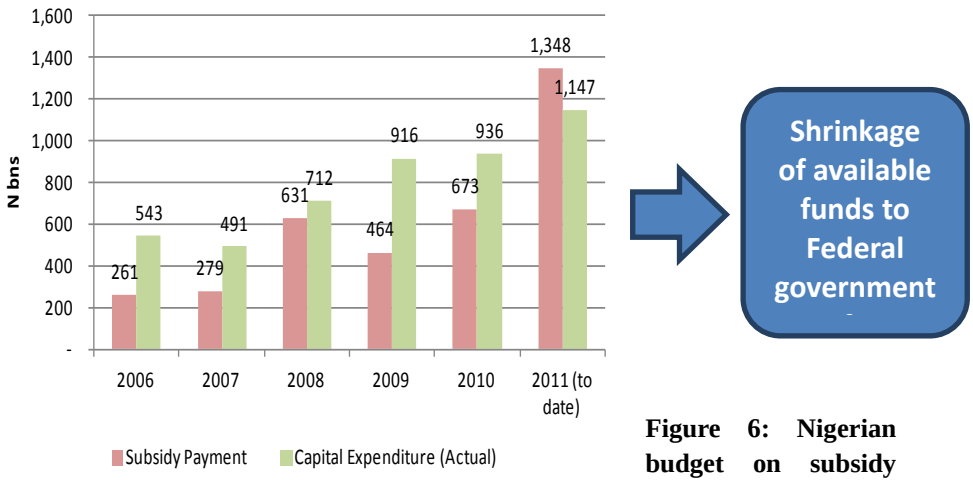


Figure 6: Nigerian budget on subsidy and capital expenditure.
Source: Ministry of Finance, Nigeria, 2013.

Effect of Subsidy on Oil and Gas Resources

The forecasted analysis of volume of savings in the year 2005 (10^6 barrels) by some major oil-producing developing countries indicated that a lower domestic price of oil and gas resources (due to the subsidy to half the global price) leads to more consumption and thus lowers the savings for the future

higher demand. This is shown in Table 8 for the major oil-exporting developing countries in the world.

Table 7: Volumes of Oil Savings

	Scenarios	
	Subsidized Price Equal to Half of the Global Price	**Subsidized Price Equal to the Global Price**
Algeria	15.6	23.1
Iran	127.4	167.5
Nigeria	27.0	44.9

Source: Birol et al., 1995.

Chapter 3: Literature Review

3.1 Theoretical Framework

Many developing countries have pervasive energy subsidies even though some countries have made enormous efforts to reduce or even eliminate their commercial energy subsidies to reduce their high economic losses amounting to billions of dollars (especially in subsidies for petroleum products, electricity, natural gas, and coal). Thus, the estimates of the forgone revenues in the oil-exporting countries approximate one-third of all oil export revenues (Kosmo, 1989). Countries need to move to rationalize energy prices at the present time as the global prices have now stabilized and the domestic inflation rates are substantially lower than in the past. The reduced subsidies can provide the world with an insurance policy against future price shocks similar to the ones in the 1990s.[17]

Based on the related literature, the oil-exporting countries are among the most energy-intensive economies globally due to the rise in the domestic demand for oil and the fact that the energy-intensive industries are developing, as mentioned by Oliver and Majda (2013). According to their research on whether there is a relationship between energy consumption and economic growth, where they used recently developed panel econometric techniques, there is a long-run equilibrium relationship between energy consumption and economic growth. As petrol is considered among the major fuels used by the

[17] Kosmo, 1989.

transport and other industrial sectors in Nigeria, it has a great tendency to influence the economic performance of the country.

The major characteristics of the energy markets in oil-exporting developing countries are the high levels of subsidies on petroleum products and the low energy use efficiency, as determined in the research conducted by Birol, Aleagha, and Ferroukhi (1995) on the economic impact of subsidy phase-out in three oil-exporting developing countries (Algeria, Iran, and Nigeria), where they used the standard econometric approach. It was suggested in such work that the partial or total removal of subsidies and/or the non-price improvement of the energy use efficiency would allow these countries to save substantial amounts of oil from domestic consumption, which would in turn be translated into additional revenues. There has been a pronounced waste of the resources needed to fuel their development, considering the oil endowment and the higher energy subsidization[18], leading to low energy prices that can be used to promote industrialization and economic diversification (to generate employment and to enhance the economy's global competitiveness).

Premium motor spirit (widely known as petrol or gasoline) is the most widely consumed petroleum product in Nigeria mainly in the transport sector. The study by Ukah (1999) involving an empirical analysis of the impact of the

[18] According to the IEA measures and report, oil-exporting countries are among the largest energy subsidizers (Joint Report by IEA, OPEC, OECD, and World Bank on Fossil Fuel and Other Energy Subsidies: An Update on the G20 Pittsburg and Toronto Commitments, 2011).

gradual withdrawal of subsidy on the domestic gasoline consumption in Nigeria between 1977 and 1999, using an OLS econometric model approach and the logarithmic function of the explanatory variables (income as real GDP, price of gasoline, and price of automotive gas oil), found that subsidy withdrawal or increasing the price of gasoline has no significant effect on the domestic consumption of the commodity, implying an inelastic response of price to demand. Ukah (1999) further asserted that increases in the prices of petroleum products will definitely increase the revenue base of the government and marketers, and will impoverish the consumers, in the end sending negative shocks to the economy.

Another study was recently conducted by Akanbi et al. (2013) on gasoline as the highest consumed petroleum product in Nigeria, using the basic descriptive statistical method and Pearson's product-moment correlation coefficient. The results showed that the deregulation of the downstream oil sector did not yield the desired result in terms of the decrease in the prices of petroleum products. Also, it was discovered that despite the increase in the prices of petroleum products, their rate of consumption continued to increase. In developing countries, the lower-income households use relatively more kerosene as a percentage of household income than the higher-income ones. Thus, kerosene subsidy primarily benefits the middle- and upper-income classes[19], which may be the main reason for the government's insistence on continuing the implementation of the kerosene subsidy pricing scheme in the

[19] Kosmo, 1989.

country.

The fuel subsidy removal has also affected the prices of food items, according to a study conducted by Ekine and Okidim (2012) using simple regression analysis, where it was recommended that the policy of fuel subsidy removal be implemented gradually to avoid a further increase in the prices of food items (which will in turn lead to financial inflation). Considering the large dependence on the oil resources and industry, any effect on the petroleum industry, particularly petrol, which drives 80% of the country's socioeconomic and national livelihood, will have a multiplier effect on the people (Desmond, 2012). This was also evident from the social accounting matrix (SAM, 2008) data analysis conducted by Tri Widodo et al. (2012) on Indonesia to analyse the impact of fuel subsidy withdrawal on government spending, where it was observed that the overall effect of fuel subsidy removal was negative due to the high reliance of the sectors on fuel subsidy (the multiplier effect of removal is higher than that of any direct reallocation scheme) and also the non-consideration of reduction in inefficiencies such as traffic congestion, excessive use of personal vehicles, and unequal distribution of subsidized fuel among the energy sectors.

The results of the study conducted by Oliver Damette and Mada Seghir (2013) on the ongoing debate over whether there is a relationship between energy consumption and economic growth, where a panel econometric technique was used, indicated that there exists a long-run equilibrium relationship between energy consumption and economic growth. Furthermore,

the empirical evidence that they obtained by using a dynamic panel error correction model revealed a short-run unidirectional causality from energy consumption to economic growth, whereas in the long run, it is the economic process that determines the energy consumption trend. The studies on panel VECM can be traced back to Lee (2005), who conducted a study on 18 developing countries from 1975 to 2011 and found that causality runs from energy consumption to GDP.[20] This shows the evident need to assess the impact of petroleum product consumption on the economic performance of Nigeria, which is among the most energy-intensive oil-exporting countries in the world, due to the rising demand for petroleum products and the development of energy-intensive industries therein.[21]

There is a close relation between the measured subsidy rates and the potential for energy savings. Even though Indonesia has high subsidies (27.51%), it has relatively low energy savings (7.09%)[22] due to its high biomass percentage and the concentration of its energy subsidies on petroleum products, which have very low elasticities of demand and thus less energy savings from subsidy removal. Nevertheless, Indonesia's gasoline/diesel consumption continued to decline as a result of the subsidy reductions in late June 2013.[23]

Clements et al. (2003), in their computable general equilibrium study of

[20] Chiou-Wei et al., 2008, p. 3064.
[21] Damette, 2013.
[22] IEA, 1999, World Energy Outlook Insights, Looking at Energy Subsidies: Getting the Prices Right, OECD, Paris, p. 65.
[23] OPEC, Monthly Oil Market Report, September 2013.

Indonesia's fossil fuel producer subsidy reform, found that a reduction in the subsidy increases the production costs, which leads to price increase in other sectors, particularly the energy-intensive sectors such as utilities, construction, and mining and quarrying, which reduces the overall consumer product demand. In turn, the production is decreased, which leads to a decreased demand for labour and capital inputs, which in turn reduces household incomes, thereby reducing the consumer demand. In the Keynesian (the real output is reduced in the short term) and non-Keynesian (decline in government deficit and public debt resulting from the decline in subsidies) modelling study conducted by Clement et al., in both cases, the aggregate price level increased by 1.1% as a result of the 25% (a fiscal multiplier of two on 1% of the GDP represented by the subsidies) increase in petroleum product prices. In the Keynesian model, the reduction in subsidies reduced the real output by 2% due to the second-order effects on production and income.

3.2 International Petrol Subsidy Experience

Several developed and also developing countries have implemented fossil fuel subsidy policy reforms. These countries include Argentina, Indonesia, Ghana, South Korea, Mexico, China, Russia, USA, and many others. Six important reform approaches were identified by the International Institute for Sustainable Development (IISD): research, establishment of reform objectives and parameters, building a coherent reform strategy, implementation, clear progress frames, and monitoring and evaluation. Some of these countries'

experiences are highlighted below.

Ghana (Petrol)

The subsidy reform attempt started in 2001 in collaboration with the International Monetary Fund (IMF), as a part of the Poverty Reduction and Growth Facility Program. The fuel prices were raised by 91% by the government in a bid to deregulate the sector, and in June 2001, an automatic price setting mechanism was introduced to resuscitate the state-owned Tema Oil Refinery (TOR) and to pay its mounting debts, but it could no longer be sustained and was abandoned in 2002, when the international oil prices rose. The debt continued to ascend, equalling about 7% of the GDP (IISD, 2010).

A second unsuccessful attempt was made in 2003 but was suspended in June of the same year due to the rise in international oil prices. To mitigate the subsidy removal impact on the poor, the Ghana government introduced a number of policy measures: establishment of the Deregulation Mitigation Levy and Unified Petroleum Fund, introduction of tuition fees in public primary and secondary schools, increasing the number of mass transit buses, introduction of a price ceiling on public transport fares, increasing the funding for healthcare services in rural areas, raising the daily minimum wage from USD1.24 to USD1.50, and also the implementation of rural electrification projects. The government also intends to continue its cross-subsidy on kerosene and liquefied petroleum gas (LPG).

Due to the subsidy provided for kerosene, it was used for the adulteration

of diesel and also for smuggling to the neighbouring countries with higher sales prices. According to IISD (2010), the Ghana case was recorded as a success for the following reason: “Research was conducted to identify those most likely to be impacted by reform; a communications strategy was employed to increase popular support; semi-independent and transparent institutions were established to manage fuel pricing; the domestic prices were linked with the international prices; and policies were implemented to reduce the impacts on the poor.”

Chile (Petrol, Diesel, Kerosene, and Coal)

Energy reform in Chile began in the 1970s, targeting the reduction of state involvement in productive activities (as part of larger social and economic reforms). The reform was done in two phases, as discussed below.

“In the first phase, from 1974 to 1977, a process to prepare the necessary economic and financial conditions for the reform in the energy sector was begun” (UNEP, 2003:125). At this stage, the energy prices were adjusted to make them closer to the prices in the global market.

“The second phase (1978-1989) emphasized institutional reforms, including those relating to the regulatory framework and legal aspects and ownership” (125). At this stage, National Energy Commission (NCE) was established to implement the energy policies. As there was privatization of oil products, the state-owned oil firm ENAP retained the responsibilities of exploration, production, importation, and refining. The oil product prices were

semi-regulated, with the ex-refinery prices freely set but in justification with the prices of imported products, in addition to a 10% importation tax. The final prices were set after the addition of the transport, storage, and marketing cost estimates in addition to the 18% VAT that was added.

The Chilean government established a price stabilization fund in 1999 to offset the effects of the international oil price fluctuations. The predetermined differential price was adjusted for the individual products, and either a loan was paid by the government or a tax was levied on the fund, depending on the difference. With the rise in international oil prices, however, the government's cost became so huge that it led to the reform of the system in 2000. A new fund was established that sets caps, and new rules required it to act as a stabilization fund and no longer as a subsidy fund.

In a simulation study, UNEP (2003) stated the possible impacts of subsidy reform as follows: "A key conclusion of the analysis for Chile is that removing oil subsidies could have bigger economic and distributional effects than removing coal subsidies. This is mainly because the consumption of oil is much larger than that of coal. Not surprisingly, the effects on the sectors concerned, namely oil refining and coal production, are much bigger in each case. The environment clearly benefits from the removal of both the coal and oil subsidies" (126-127).

Angola (Petrol)

The fuel prices are uniform in the country, controlled by the government

and heavily subsidized. Only the price of petrol was raised in September 2010. The fuel subsidies in 2011 amounted to 7.8% of the GDP (USD7.9 billion)[24], equivalent to more than 90% of the public investment spending. There exists only one small, old refinery, and the plan to build a new larger refinery has encountered a series of problems in terms of attracting investment.

Indonesia (Petrol and Diesel)

The prices of one grade each of petrol, diesel, kerosene (for households and small businesses), and LPG are controlled and heavily subsidized. The prices of other grades of petrol and diesel are market-based, but the national oil company Pertamina and not the government subsidizes the LPG sold in larger cylinders, reportedly costing Pertamina Rp.3.8 trillion (USD0.43 billion) in 2011. The price of the LPG subsidized by the government has been frozen for years. After raising the fuel prices twice in 2005 and once in 2008, the government lowered the prices of petrol and diesel (but not of kerosene) in December 2008 and January 2009, respectively, and has not adjusted the prices since. In March 2012, the parliament voted to block the government's revised 2012 budget proposal to raise the subsidized fuel prices, and agreed to allow the option of a price increase only if the six-month average price of Indonesian crude oil rose 15% above the budget oil price (to USD121/b). The annual government expenditures on fuel subsidies soared to USD23 billion in 2012.

[24] IMF, August 2012.

Table 8: Indonesia's Annual Fuel Subsidy Expenditures as % of GDP

Year	2006	2007	2008	2009	2010	2011	2012
USD billion	7.0	9.2	14.3	4.3	9.1	18.8	22.6
% of GDP	1.9	2.1	2.8	0.8	1.3	2.2	2.6

Source: Government of Indonesia, 2013

Jordan

The government controls the fuel prices and removed its subsidies from all fuels, except LPG, in February 2008, and adopted a monthly price adjustment mechanism but stopped adjusting the prices of petrol, diesel, and kerosene in January 2011, which were raised in December 2010 but lowered in January 2011 in response to the events in Tunisia and elsewhere in the region. An expert panel formed by the prime minister in May 2011 recommended the use of smart cards for subsidized goods instead of price subsidies. The kerosene and diesel prices remained unchanged, except for a brief rise in September 2012. In May 2012, Jordan raised the price of petrol to JD1 (USD1.41)/litre from JD0.795 (USD1.12), and substantially raised the electricity tariffs for the major industrial and service sectors. In November 2012, unable to shoulder the growing budget deficit, the government increased the price of LPG in 12.5kg cylinders by 54%, and the kerosene and diesel prices by 33%. The government began making monthly adjustments in December 2012 for all fuels, except LPG. For a certain period, the retail price was lower than the FOB price, signalling a large subsidy.

Jordan has one refinery with an about 100,000 bpd capacity, and imports

100% of its oil demand.

Table 9: Jordan's Annual Fuel Subsidy Expenditures as % of GDP

Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
USD million	707	394	432	278	61	94	714
% of GDP	5.6	2.6	2.5	1.3	0.3	0.4	2.4

Source: IMF, 2013

Malaysia

The prices in the remote areas are higher, and the government has been taking steps to implement a "one nation, one price" policy to equalize the prices across the country. An additional diesel subsidy scheme for eligible commercial vehicles and river passenger boats was introduced in the 2002 budget. Four groups of consumers have been entitled to additional diesel price subsidies: fishing boats, which paid the lowest price per litre; passenger river boards; fleet card holders; and public transport operators. In June 2011, the government suspended the additional subsidy scheme for nine vehicle categories and certain fishing boats. The annual subsidies for the three fuels had increased to USD6.6 billion by 2011, with petrol and diesel dominating in most years.

Table 10: Malaysia's Annual Fuel Subsidy Expenditures as % GDP

Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
USD billion	2.2	2.0	2.6	4.6	1.6	2.8	6.6
% of GDP	1.6	1.3	1.4	2.1	0.8	1.2	2.4

Source: Government of Malaysia

The energy subsidies remained high in 2012, but the increased revenues from the high oil prices and the strong tax collection have more than offset the subsidy increases.

As can be seen in Table 11, some studies have been conducted on the fossil fuel subsidy reforms in different sectors. In the study conducted by Burniaux et al. (2009), it was predicted that there will be a 0.2% global GDP increase by the year 2050, and also 0.2 and 0.1% GDP increases in the OECD and non-OECD countries, respectively, while in their other research, a peak outcome of a 0.7% global income increase by 2050 was predicted. Fossil fuel subsidy reform impacted the non-OECD countries the most, which are expected to have a 1.8% annual income increase by 2020, according to Larsen and Shah (1992).

Table 11: Summary of Economic Effects of Fossil Fuel Subsidy Reform

Study	Income or GDP Increases (Global)	Income or GDP Increases (OECD)	Income or GDP Increases (Non-OECD)	Total Economic Efficiency Cost
Burniaux et al., 2009	0.2% higher in 2050	0.2% higher in 2050	0.1% higher in 2050	NA
OECD, 2000	0.1% by 2010	NA	NA	NA
Saunders & Schneider, 2000	NA	0.1% higher in 2010	0.45% higher in 2010	
IEA, 1999	NA	NA	0.73%	USD17.2 billion
Burniaux et al., 1992	0.7% per year up to 2050	0.1% per year up to 2050	1.6% per year up to 2050	NA
Larsen & Shah, 1992	NA	NA	1.8% per year up to 2020	USD33 billion

Source: The Global Subsidies Initiative, 2010

In summary, most of the previous researches that applied a similar methodology demonstrated that the domestic demand or consumption of petrol is not affected by price fluctuations, but subsequently, the increases will positively influence the national income, as indicated in Table 12. This inclination in petrol influences the price increase of food items, as observed in a study conducted by Ekine and Okidim (2001). The use of simple regression by Maxwell and Harold (2010) to analyse the fuel subsidy impact in Nigeria demonstrated that the excessive demand for fuel is being reduced through subsidy withdrawals.

Table 12: Previous Empirical Researches with a Similar Methodology

Author(s)	Type of Study	Methodology	Results & Conclusion
Birol, Aleagha, & Ferroukhi (1995)	The Economic Impact of Subsidy Phase-out in Oil in Algeria, Iran, and Nigeria	Standard econometric approach and autonomous energy efficiency improvement	Petrol consumption is not responsive or sensitive to price change. Petroleum price increase positively affects national income.
Ekine & Okidim (2001-2002)	Analysis of the Effect of Fuel Subsidy Removal on Some Food Prices in PH and Nigeria	Tables, percentages, simple regression	Fuel price increase also increases the prices of food items.
Ukah	Empirical Analysis of the Impact of the Gradual Withdrawal of Subsidy on Petrol Consumption in Nigeria (1977-1999)	Econometrics (regression analysis of elasticities)	The consumption of PMS is not responsive to price change. The prices of petroleum products have a positive effect on government revenue.
Maxwell & Harold (2010)	Fuel Subsidy in Nigeria: Fact or Fallacy	Simple regression	Fuel subsidy withdrawals reduce excessive fuel demand.

Chapter 4: Research Method

4.1 Data and Methodology

Data Used and Coverage

To conduct a study using econometrics, which consists of a series of variables on prices over time, there is a need to net out the effect of inflation by adjusting the nominal prices to a base year (by adjusting the values into the year 2005). This is shown as follows:

Real value = (nominal value) x (adjustment factor)

The adjustment factor was formed using the CPI measures. Thus:

Real $value_Z$ = (nominal $value_Z$) x ($CPI_{base\ year}/CPI_Z$).

The analysis will be based on the annual series of petrol prices, starting from the year when gradual subsidy withdrawal began (1986).

Table 13: Variable Descriptions and Sources

Variable Name	Description	Source
Y	Annual income[25] (million naira)	World Bank annual data
PC	Petrol consumption (billion litres)	PPPRA, Nigeria
PP	Petrol price (naira per litre)	
PS	Petrol subsidy (naira per litre)	Min of Fin., Nigeria

The raw data obtained on the Nigerian GDP was also normalized to the 2005 standard using the GDP implicit price deflator, as follows:

[25] Annual income implies GDP (Akanbi, 2013; Ovaga, 2012).

Real GDP = (nominal GDP/GDP deflator) x 100.

Table 14: Descriptive Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Y	26	8.26e+10	3.77e+10	4.27e+10	1.67e+11
PC	26	7.034615	4.560346	3.2	21.9
PP	26	39.63846	18.34783	9.1	86.5
PS	26	11.56885	7.445995	2.16	34.22

Table 14 shows the descriptive statistics of the level data that were used for the empirical study. A total of 26 observations (1986-2011) were used for this empirical study, with the standard deviations of the four variables and the respective minimum and maximum values. Also, as indicated, income was represented as “y,” petroleum consumption as “pc,” petroleum price as “pp,” and petrol subsidy as “ps.”

4.2 Model Estimation

The econometric approach was adopted in estimating the log variables to determine the elasticity of the variables and its implications.

A similar data analysis estimation method was used by Ukah (1999) for the data variables before the government implemented the Structural Adjustment Programme (SAP) 1977-1986 and 1987-1997.

This research covered the period 1986-2011 to capture the whole duration of the subsidy withdrawal effects of petrol as the major fuel used in the country for transportation and domestic cooking.

The econometric approach was used to depict the causality and the

impacts (elasticity) of the petrol price, subsidy, and demands on income (GDP).

4.3 Energy Subsidy Model Estimation

Energy pricing in oil-exporting developing countries is influenced by the sociopolitical motive of the government to use the oil endowments as a social good to benefit the following:

(i) the poor, who comprise majority of the population; and

(ii) industrial production.

In the 1970s, oil pricing policies were established, and in the 1980s, the governments could not maintain such levels of expenditures. Thus, there were balance-of-payment problems that led to the inability to meet the debt obligations.

A conceptual graph of the domestic demand for and supply of oil is shown in Figure 6.

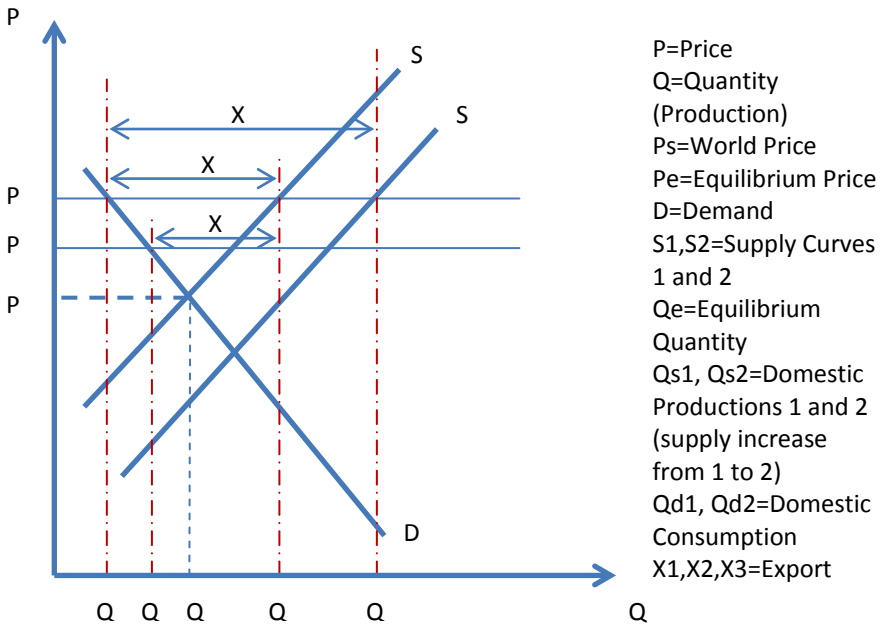


Figure 6: Domestic demand-supply concept for oil-exporting countries.
Source: Birol et al., 1995.

With the introduction of subsidy (Figure 7), the domestic price (Ps) will be below the world price (Pw). While the domestic production remains stable at (Qs1), the domestic consumption increases from Qd1 to Qd2, and the export availability falls from X1 to X2. This leads to a decrease in potential earnings (thus, a possible effect on economic growth).

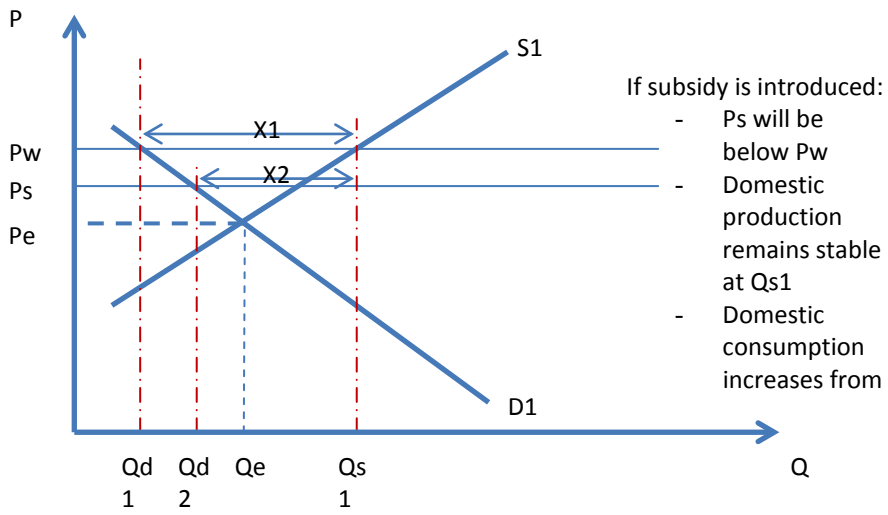


Figure 7: Subsidy for domestic consumption.
Source: Birol et al., 1995.

On the other hand, if subsidy is introduced for domestic producers (Figure 8), the supply curve shifts to the right (from S1 to S2), and the production increases to Qs2. Thus, the exports were raised threefold (as the domestic quantity demanded remained stable), but with the resources exhausted or wound down more rapidly, the long-run export capacity (revenue source) decreases.

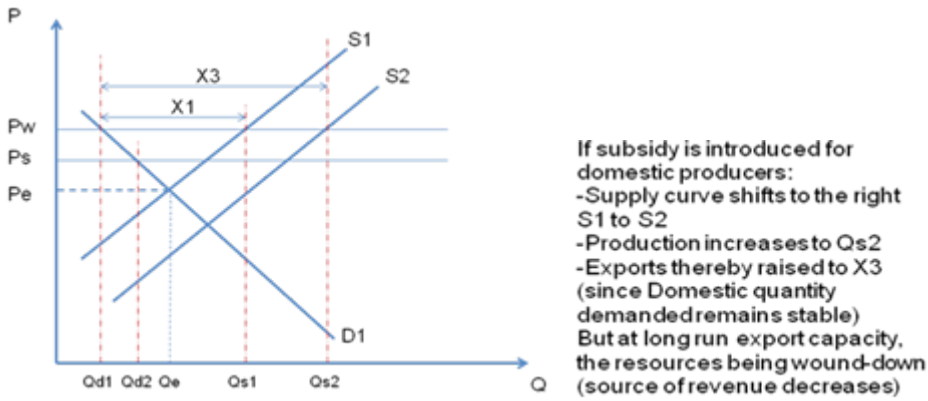


Figure 8: Subsidy for domestic production.
Source: Birol et al., 1995.

Empirical Framework

1. <u>From the demand-supply relationship</u>:

Demand = f(price, income), which also postulates that

Income = f(price, demand), and

$$Y = f(P_P, P_C), \quad (1)$$

where Y = income or GDP,

P_P = price of petrol,

P_C = petrol demand (consumption), and

$$Y = a_0+a_1P_P+a_2P_C+E_t, \quad (2)$$

where $a_1>0$, $a_2<0$; E_t = error term; a_1 and a_2 = parameters of the model and price elasticities, respectively.

The econometric approach was adopted in the model estimation, and the log of the variables was taken to help determine the elasticity coefficient of the variables as well as its implication. Therefore:

$$LnY = a_0+a_1LnP_P+a_2LnP_C+E_t. \quad (3)$$

2. Price effect on consumption

This signifies the dependence of product consumption on the price of petrol, which also relates to the subsidy per litre of petrol.

$$P_C = f(P_P, P_S), \quad (4)$$

where P_S = petrol subsidy, and

$$P_C = a_3+a_4P_P+a_5P_S+E_t, \quad (5)$$

where $a_4<0$, $a_5>0$; E_t = error term; and a_4 and a_5 = parameters of the model and price elasticities, respectively.

The econometric approach was adopted in the model estimation, and the log of the variables was taken to help determine the elasticity coefficient of the variables as well as its implication. Therefore:

$$LnP_C = a_3+a_4LnP_P+a_5LnP_S+E_t. \quad (6)$$

OLS Estimation

The multiple regression technique was first used for the examination of the economic variables of petrol subsidy, petrol price, and petrol consumption to determine if they have a relationship with income. This will indicate the overall impact of the explanatory variables and their significance on income as the dependent variable.

Multicollinearity

The existence of a high correlation between any two of the explanatory variables signifies multicollinearity. This makes the variables insignificant by

increasing their standard errors (as the t-value goes down and the corresponding p-value becomes higher). There is a need to present the correlation matrix (shown in Appendix B) as the high correlation between some of the variables has some effects, and the relationships were expressed in such a way as to omit the effects of the correlation.

Time Series Analysis

This test is considered to prove that the variable data were accounted for over a period of time (1986-2011), and to determine if an autocorrelation exists between the variables while using the OLS technique. The possibility of trend and seasonal variation between the variables makes it necessary to analyse the causal relationship between two or more of the variables. Figure 9 shows the procedure of analysing the causality of the economic parameters to be analysed.

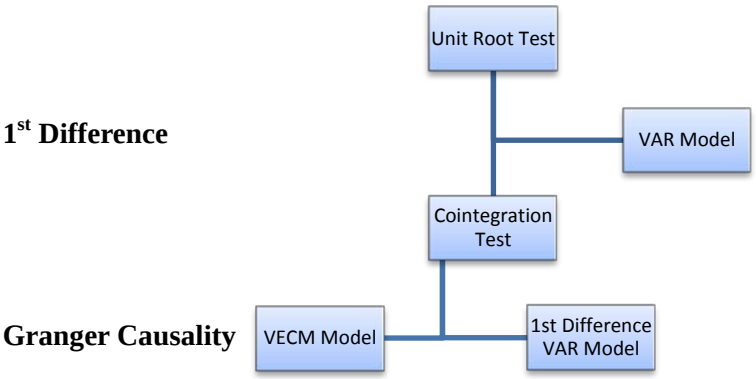


Figure 9: Time series analysis procedure.

<u>Unit Root Test</u>

The unit root test was first conducted to check for the stationarity of the

relationship by analysing the mean and variance independence over a time period. When the series is integrated to order 0 (or when there is no unit root in the time series), it is said to be stationary. Thus, to perform further empirical analysis of a non-stationary data, it has to be integrated to order 1. This is also referred to as the Dickey-Fuller test.

Consider the following two alternative models to represent the income series:

$y_t = a + b_t + e_t$, and Model 1

$y_t = a + y_{t-1} + e_t$, Model 2

where y_t represents the natural logarithm of income at time t, *t* represents a time trend, *b* is a constant that gives the growth rate of the variable, and *e* implies an error term. The initial specification implies that income equals the constant a at the initial time of zero ($y_0 = a$), and grows at a constant rate b over time. The error term explains the deviations from the trend in each year. Thus, the variable $a + b_t$ in model 1 is described as trend-stationary (TS), and stationarity is achieved by removing the time trend (i.e., regressing y_t on t). Another feature is that the variance of y_t is bounded by the variance of e_t, and the linear forecast of income approaches the time trend $a + b_t$ as the forecast horizon increases.

Model 2 is expected to be non-stationary, and it is expected that it cannot be made stationary by removing the time trend or basically detrending, but the

first difference of the series is given by $a + e_t$, a stationary process. Substitution can be done repeatedly for the lagged y_t value in Model 2 to get:

$$y_t = y_0 + a_t + \sum_{i=1}^{i} e_t. \tag{7}$$

Model 2 represents the unit root hypothesis, the term arising from the fact that the coefficient of y_{t-1} is unity.

Two variables that have a long-run relationship are said to be co-integrated. According to Elder and Kennedy (2001), "The ADF test has become the most popular among the many computing tests in the literature." The OLS model is expressed as

$$y_t = a + bt + uy_{t-1} + e_1, \text{ and} \tag{8}$$

$$\Delta y_t = (u - 1)y_{t-1} + a + bt + e_1, \tag{9}$$

implying u=1 (null hypothesis of the unit root) via t-test.

<u>Granger Causality Test</u>

Thus, the Granger causality test is conducted for the first difference of the variables due to non-stationarity after conducting the unit root test (ADF test). The Granger causality test (Granger, 1969) is designed for the detection of the causal direction between the present value of one variable and the past variables of another variable. Consider a bivariate VAR model with the following two time series y_t and x_t:

$$\Delta Y_t = \alpha_{12} + \sum_{i=1}^{T11} \beta_{11i} \Delta Y_{t-i} + \sum_{j=1}^{T12} \beta_{12j} \Delta X_{t-j} + v_{12t}, \text{ and} \quad (10)$$

$$\Delta X_t = \alpha_{22} + \sum_{i=1}^{T21} \beta_{21i} \Delta X_{t-i} + \sum_{j=1}^{T22} \beta_{22j} \Delta Y_{t-j} + v_{22t}, \quad (11)$$

where Δ is the difference operator, T is the lag order, α and β are the parameters for the estimation, and v_t is an error term. To test for the Granger causality running from X to Y, the null (H_0) hypothesis can be expressed as:

H_0: $\beta_{12j} = 0$ j = 1,2,…..q.

If H_0 is rejected (at least one of the β_{12j}s is not equal to zero), then this suggests that the past value of X has a significant linear predictive power on the present value of Y. It is then said that X Granger-causes Y, and vice versa.

<u>Johansen Co-integration Test</u>

When the relationship data are of the order I(1) but are not co-integrated, the test requires them to be transformed into I(0). The equations for the Granger type are written in the following simpler forms:

$$\Delta Y_t = \alpha + \sum_{i-1}^{q} b_i \Delta Y_{t-i} + \sum_{j-1}^{r} c_j \Delta X_{t-j} + v_t, \text{ and} \quad (10`)$$

$$\Delta X_t = \alpha + \sum_{i-1}^{m} \beta_i \Delta X_{t-i} + \sum_{j-1}^{n} \gamma_j \Delta Y_{t-j} + u_t. \quad (11`)$$

The optimum lag selection criteria for m, n, q, and r are determined through the use of the Akaike information criterion (AIC), Schwartz Bayesian information criterion (SBIC), and Hannon Quinn information criterion (HQIC)

for the most common among the tests.

$$AIC_c = \left(\frac{2n}{n-k-1}\right) k - 2\ln[L_{max}], \quad (12)$$

$$SBIC = \ln[n]k\text{-}2\ln[L_{max}], \text{ and} \quad (13)$$

$$HQIC = 2\ln\left[\ln[n]\right]k\text{-}2\ln[L_{max}], \quad (14)$$

where n = number of observations; and

K = maximum value of the log likelihood for the estimated model (i.e., to fit the parameters by maximum likelihood estimation, and to record the natural log of the likelihood).

The lag selection criteria result is shown in Table 15 for Y against PS, in which Lag 7 was selected as the optimum lag indicated by the three ICs (AIC, HQIC, and SBIC). Similarly, the optimum lag selection for Y against PS, as indicated in Table 16, shows Lag 1 as the optimum.

Table 15: Optimum Lag Selection Criteria for Y against PP

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-497.887		4.5e+21	55.5418	55.5555	55.6408
1	-447.859	100.03	2.7e+19	50.4288	50.4698	50.7256
2	-442.174	11.372	2.3e+19	50.2415	50.3097	50.7362
3	-438.555	7.2382	2.6e+19	50.2838	50.3793	50.9764
4	-436.268	4.5739	3.5e+19	50.4742	50.597	51.3646
5	-433.786	4.9633	5.0e+19	50.6429	50.7929	51.7311
6	-422.565	22.443	3.2e+19	49.8405	50.0178	51.1266
7	**-407.975**	**29.18***	**2.0e+19**	**48.6639***	**48.8685***	**50.1478***
8	**-**	**--**	**-9226.08***	**-**	**-**	**-**

Table 16: Optimum Lag Selection Criteria for Y against PS

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-513.493		2.6 e+22	57.277	57.2906	57.3759
1	**-467.976**	**91.034**	**2.6 e+20**	**52.6639**	**52.7049***	**52.9607***
2	-465.042	5.8676	3.0 e+20	52.7284	52.8506	53.2771
3	-462.575	4.9326	3.7 e+20	52.9528	53.0483	53.6453
4	-458.724	7.7034	4.2 e+20	52.9693	53.0921	53.8597
5	-457.943	1.5609	7.4 e+20	53.327	53.5771	54.4153
6	-453.019	9.8493	9.6e+20	53.2243	53.4016	54.5104
7	**-443.094**	**19.85***	**1.0e+21**	**52.566***	**52.7706**	**54.0499**
8	**-**	**-**	**-123954***	**-**	**-**	**-**

Key:
* the selected lag
LR: Likelihood ratio
FPE: Final prediction error
AIC: Akaike information criterion
HQIC: Hannan Quinn information criterion
SBIC: Schwarz Bayesian information criterion

In the Johansen co-integration test, the variables must be non-stationary at a certain level, but after their conversion into first difference, they must be stationary (variables integrated to the same order). If the series becomes stationary (no unit root) after the conduct of the ADF test, this signifies the application of the vector auto regression (VAR) model. VAR captures the linear interdependencies among multiple time series, and each variable has a relationship that explains its existence based on its lags and those of the other variables.

T-stat < critical value implying that there is no co-integration

VECM is also a model used when co-integration exists among the differential series. This method can explain both short and long runs and also strong causality, whereas VAR can analyse only the short-run causality.

Granger causality is conceptually designed to detect the causal direction between two time series. It precisely detects the correlation between the current value of one variable and the past values of another variable.[26] According to the outcome of the analysis, the VAR model is suitable as the methodology to be employed in analysing the impact of petrol subsidy on the economic performance of Nigeria, with income as the dependent variable and petrol consumption and petrol subsidy as the explanatory variables.

[26] Song et al., 2008.

Chapter 5: Results

5.1 Result from International Comparisons

Compared to the major OPEC member countries as in Figure 10, Nigeria has the highest domestic pump price of petrol with an equivalent price of N65 per litre followed by Iran with N58.4 per litre (as indicated in Nigerian currency terms). This implies that Venezuela is among the countries with the highest subsidy support on local price of petrol in 2011 with a value of N5.84 per litre of petrol.

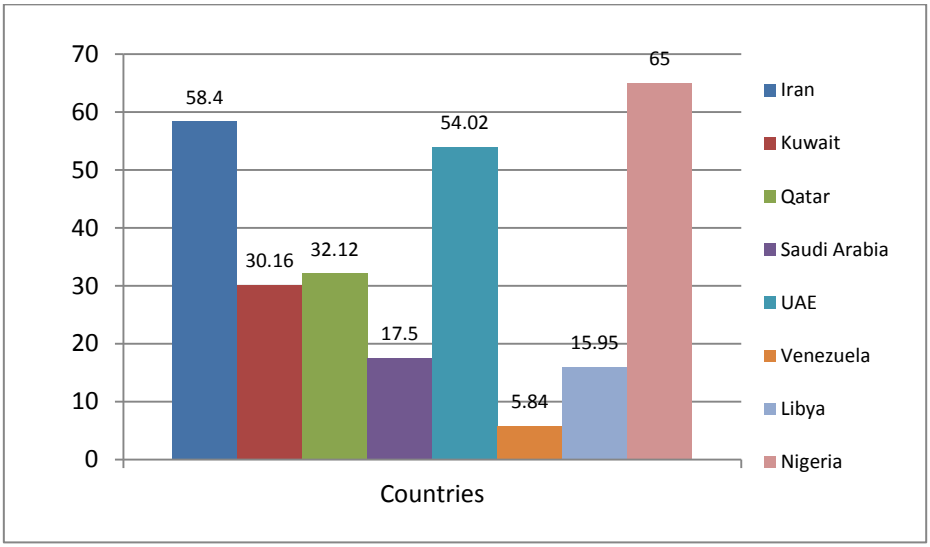


Figure 10: Pump Price per Litre of Petrol in Some Exporting Countries

Source: Adopted from Umukoro A. and Adeyemi A. (2011:50)[27]

Among the highlighted countries, Nigeria is considered to be having the highest proportion of subsidy funding from the national income as seen in

[27] Article titled "The Fallacy of Fuel Subsidy," *The Tell*, November 28.

figure 11.

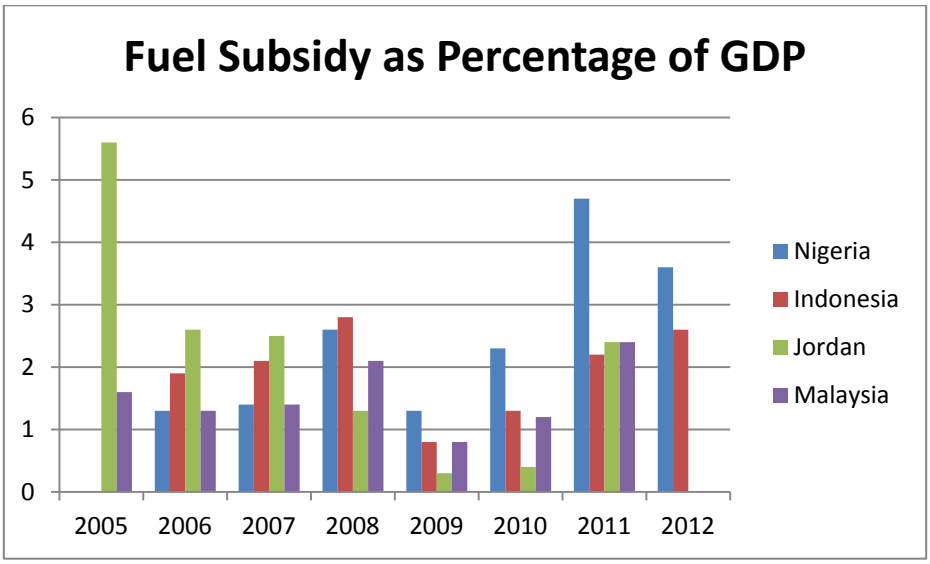


Figure 11: Comparison in terms of Subsidy proportions to GDP

Source: IMF 2013

5.2 OLS Regression Analysis

<u>Regression of Income (GDP) against Petrol Price, Subsidy, and Consumption</u>

To check the overall statistical significance of the estimation and explanatory variables, the income was regressed against the explanatory variables (domestic petrol price, petrol consumption, and petrol subsidy) using ordinary least squares (OLS) analysis.

A variable's significance is established by a "p>|t|" value less than 0.05 or a 5% confidence interval, and by a t-value greater than 1.76. Table 17[28]

[28] Refer to Appendix 1 for a more detailed results table.

explains the independent variables (R^2=.9306; F=98.27), demonstrating that an increase in petrol consumption (P<0.00; coeff=0.6879) has a positive impact on the national income. The result indicated that the t-value of 8.47 for petrol consumption makes it the only significant variable (also with a positive impact on income). If a 10% significance level will be considered, the petrol price can be said to have a significant positive effect on income, with a 1% positive change in price leading to an approximately N0.18 billion increase in the national income.

Table 17: OLS Regression of Y against PP, PS, and PC

LnY	Coeff.	Std. Err.	t	P>/t/	95% Conf. Interval	
LnPP	0.1861791	0.1063503	1.75	0.094	-0.034378	0.4067361
LnPS	-0.029846	0.1166003	-0,26	0.800	-2.716603	0.2119683
LnPC	0.6879071	0..812605	8.47	0.000	0.519383	0.8564311
Cons-tant	23.21727	0.2480537	93.60	0.000	22.70283	23.7317

R^2=0.9306

<u>Significant variable:</u> Petrol consumption (unit: billion litres). The estimated relationship is as follows:

$Y = 23.21727+0.6879071P_C+E_t$.

The results indicate that a 1% increase in the domestic consumption of petrol will lead the national income to increase by N0.69 billion. The other explanatory variables, namely petrol price (P>t=0.094) and petrol subsidy (P>t=0.800), indicate an insignificant effect on the national income because of their hypothetical values that are not within the probability boundary.

Referring to the multicollinearity result within the explanatory variables as in Table 18, indicates that the correlation values between income and petroleum subsidy and between income and petroleum consumption are 0.8069 and 0.9461, respectively. There is also a high correlation between petrol price and petrol subsidy (correlation value: 0.8582). These outcomes show that there is a need to conduct time series analysis to observe the variables' (petrol consumption and petrol subsidy) effects on income over time.

Table 18: Correlation Matrix of $Y = f(P_P, P_C, P_S)$

	LnY	**LnPP**	**LnPS**	**LnPC**
LnY	1.0000			
LnPP	0.5740	1.0000		
LnPS	0.8069	0.8582	1.0000	
LnPC	0.9461	0.4273	0.7384	1.0000

5.3 Time Series Analysis

Regarding the objective of this research, to analyse the impact of petrol subsidy on the economic performance of Nigeria, the national income variable is analysed with the petrol subsidy (per litre) provided by the government, and with the petrol consumption, to determine the effects over time (either in the short- or long-term effects).

The time series graphical trends on the path of the local (or pump) petrol price and the subsidy are similar, signifying that the local petrol price and subsidy have similar effects on the income (thus, the decision to consider only the petrol subsidy). The mere observation of the trends indicates the non-

stationarity nature of the time series graph of both petrol subsidy and petrol consumption (see Appendix 4).

Unit Root (Augmented Dickey Fuller) Test

As per the procedure described in the previous chapter for time series analysis, the t-statistic for income in Appendix 5 (t=0.183) is less than the critical value of 3.600; thus, the null hypothesis cannot be rejected at a 5% critical value, signifying that Y has a unit root or that its value is non-stationary.

H0: Y has a unit root (or Y is non-stationary).

H1: Y has no unit root (or Y is stationary).

Vector Autoregression (VAR) Test

Verifying the application of VAR in the unit root test shows the need to test for the existence of a causal relationship between income and the variables (petrol consumption and petrol subsidy).

The result on Table 19 indicated that there is unidirectional causality running from petrol consumption to income at a 95% confidence interval; thus, an effective increase in the domestic petrol consumption will lead to an increase in the national income. The result also indicated a bidirectional causality running from income to petrol subsidy at a 95% confidence interval.

Table 19: Vector Autoregression Result

Dependent Variable	Explanatory Variable	Z Value	P>/Z/	95% Confidence Interval
Y	Y	6.01	0.00	0.860813
	PC	2.41	0.016	2.78E+8
PC	Y	1.76	0.078	-1.46E-11
	PC	2.65	0.008	0.1644635
Y	Y	7.22	0.00	1.029384
	PS	1.06	0.287	-1.78E+8
PS	Y	2.00	0.046	8.01E-12
	PS	2.20	0.028	0.0535075
PC	PC	2.38	0.017	0.1027929
	PS	0.86	0.0391	-0.0797305
PS	PC	3.14	0.002	0.8365665
	PS	2.29	0.022	0.0679287

Granger Causality Test

In the Granger causality test, which is designed to detect the causal relationship between income and either petroleum consumption or petroleum subsidy, the existence of a time series relationship is determined by testing the current value of the income and either of the past variables of petrol consumption or subsidy, and as such, also consumption and subsidy. The result of this test is presented in Table 20 below, showing an L-R short-term unidirectional causality running from petrol consumption to income at a 10% confidence interval (P-value = 9.5%). The test result indicated a non-causality effect from subsidy to income or from income to subsidy. There is also unidirectional causality running from petrol subsidy to petrol consumption at

a 1% confidence interval (P-value = 0%) while there is no causality running from petrol consumption to subsidy.

Table 20: Granger Causality (Wald) Test Results

"From" Variable	**"To" Variable**	**Chi Square**	**Degree of Freedom**	**P-Value**
PC	Y	6.3736	3	0.095*
Y	PC	-	0	-
PS	Y	2.195	3	0.533
Y	PS	2.3679	1	0.124
PC	PS	2.4438	3	0.486
PS	PC	32.305	3	0.000***

Legend: * 0.10, ** 0.05, *** 0.01 (p-values within the parentheses)

Chapter 6: Policy Implications and Conclusion

6.1 Policy Implications

The petrol subsidy provided by the government influences the high consumption of the product due to its affordability by the dominant low- and medium-income earners. The national interest dictates that the country's economic performance be improved by subsidizing the petrol price, which will have a positive impact on the economy through its optimal consumption.

Subsidy removal will cause multiple increments in the petrol price, which will consequently lead to a decrease in petrol consumption and an increase in the prices of other goods and services as well as those in the transport sector (where petrol is the major driver). Forecasting a reduction in the estimated future consumption could be planned due to the expectation of higher demands.

The provision of alternative energy sources is another alternative or supplement for the control of carbon emission and the prevention of the depletion of the country's petroleum resources. It will also optimize energy consumption as a driver of economic development.

6.2 Conclusion

This paper addressed the downstream market of the petrol pump price and its relative consumption, with the aim of analysing the impact of petrol subsidy on the economic performance of Nigeria.

The data obtained indicate that more income can be generated through the domestic consumption of petrol (due to its lower price), which can be used to support the most vulnerable segments of the economy (due to the short-term negative impacts of the petrol price hike) that can hardly afford the price increments. Petrol subsidy has a significant influence on petrol consumption, which signifies that it has a positive effect on the national income (as petrol consumption influences income).

The study result shows that petrol consumption as a driver of economic development has a significant impact on the national income, thereby indicating that a decrease in the price of petrol (through subsidy provision) will also contribute positively to the economic performance of Nigeria. An alternative way for the government to boost the country's economic development is through the provision of alternate energy sources with relatively low tariffs through revenue diversification.

For the government to succeed in its push for the gradual removal of the petrol subsidy, the accrued funds from the subsidy withdrawal need to be used to address the country's critical infrastructural needs so as to help cushion the effects especially on the poor and low-income earners, who comprise the majority of the population. There is a possibility that the negative effects of petrol subsidy can be cushioned by using or importing more efficient vehicles, expanding and improving the public transportation schemes, encouraging industries to use higher-efficiency methods and to reduce their energy wastage,

and passing laws and regulations for efficiency standard improvement to suit the general living conditions.

6.3 Future Research Areas

This research can be expanded into an assessment of full subsidy removal by looking at the refineries' optimal performance to meet the domestic demand. This will cause petrol price decline due to the differential with the international price as it will be refined locally, thereby causing the exclusion of the importation and other transportation taxes.

The following basic reasons can thus be buttressed:

(1) The petrol price will decline because of domestic refining.

(2) The fund used in subsidizing petrol can be diverted to other sectors of the Nigerian economy for the sustainable growth and development of the country.

(3) Stabilizing the need to meet the domestic demand through domestic production and refining can be extended to the regional demand and supply.

References

1. Aborisade, F., 2011. The Fuel Subsidy Debate: Does President Jonathan Deserve to Continue to Rule?.
2. Akanbi T. A., Aworemi J. R. and Amoo R. O., 2013. The impact of downstream oil sector deregulation on petroleum products pricing and consumption in Nigeria. *Sky Journal of Business Administration and Management,* Vol. 1(4), pp. 33-39.
3. Central Bank of Nigeria. Statistical bulletin, vol. 17, Abuja; 2006
4. Ekine D. I., Okidim I. A., 2013. Analysis of the Effect of Fuel Subsidy Removal on Selected Food Prices in Port Harcourt, Rivers State Nigeria (2001-2012). *European Journal of Business Management,* v(4), pp. 27-31.
5. F Birol, A V Aleagha, R Ferroukhi, 1995. The Economic Impact of Subsidy Phase Out in Oil Exporting Developing Countries: a Case Study of Algeria, Iran and Nigeria. *Energy Policy,* 23(3), pp. 209-215.
6. Frank Asche, Gjelberg O, Volker T., 2003. Price Relationships in the Petroleum Market: An Analysis of Crude Oil and Refined Product Prices. *Energy Economics,* vol. 25, pp. 289-301.

7. Glasure, Y. U., Lee, A.R., 1997. Cointegration, error-correction, and the relationship between GDP and energy; the case of South Korea and Singapore. Resource Energy Econ. vol. 20, 17-25

8. Jennifer Ellis, P., 2010. *The Effects of Fossil-Fuel Subsidy reform: A review of modelling and empirical studies,* Geneva, Switzerland: The Global Subsidies Initiative.

9. Karekezi, S., 1994. Energy Policy Issues in Africa. *Resources, Conservation and Recycling,* Vol. 12, pp. 23-29.

10. King K., Deng A., Metz D., 2012. An Econometric Analysis of Oil Price Movements: The Role of Political Events and Economic News, Financial Trading, and Market Fundamentals. *Batew White Economic Consulting,* pp. 1-53.

11. Kojima, M., 2013. Petroleum Product Pricing and Complementary Policies. *Policy Research Working Paper.*

12. Kosmo, M., 1989. Commercial energy subsidies in developing countries: Opportunity for reform. *Energy Policy,* pp. 244-253.

13. Oliver Damette, M. S., 2013. Energy as a Driver of Growth in Oil Exporting Countries?. *Energy Economics,* Vol. 37, pp. 193-199.

14. Ovaga (PhD), Okey H., 2012. Subsidy in the Downstream

Sector and the Fate of the Masses in Nigeria. *Kuwait Chapter of Arabian Journal of Business and Management Review,* Vol.1 No. 6, pp. 15-34.

15. Oyedepo, Olayinka S., 2012. On energy for sustainable development of Nigeria. *Renewable and Sustainable Energy Reviews,* Vol . 16, pp. 2853-2598.
16. Chiou-Wei, Song Z., Chen C., Zhu Z., 2008. Economic growth and energy consumption revisited-Evidence from linear and nonlinear Granger causality. *Energy Economics, Vol* 30, pp. 3063-3076.
17. The Presidency, Federal Republic of Nigeria, 2013. *Subsidy Reinvestment and Empowerment Programme.*
18. Ukah O. C., 1999. An Empirical Analysis of the Impact of Gradual Withdrawal of Subsidy on Domestic Consumption of Premium Motor Spirit in Nigeria 1977-1999. pp. 86-104.
19. Widodo, T. Sahadewo, Gumilang A., Setiastuti S. U., Chaerriyah M., 2012. Impact of Fuel Subsidy Removal on Government Spending. *ERIA Research Project Report,* Issue 2011-17, pp. 173-206.

APPENDIX 1 Regression Results

Income (GDP) against petrol Price, Consumption and Subsidy

$LnY = a_0 + a_1 LnP_P + a_2 Ln\ P_C + a_3 Ln\ P_S + E_t$

```
. reg lny lnpp lnps lnpc

      Source |       SS       df       MS              Number of obs =      26
-------------+------------------------------           F(  3,    22) =   98.27
       Model |  4.13085944     3  1.37695315           Prob > F      =  0.0000
    Residual |  .308271027    22  .014012319           R-squared     =  0.9306
-------------+------------------------------           Adj R-squared =  0.9211
       Total |  4.43913047    25  .177565219           Root MSE      =  .11837

------------------------------------------------------------------------------
         lny |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnpp |   .1861791   .1063503     1.75   0.094    -.0343779    .4067361
        lnps |   -.029846   .1166003    -0.26   0.800    -.2716603    .2119683
        lnpc |   .6879071   .0812605     8.47   0.000     .519383    .8564311
       _cons |   23.21727   .2480537    93.60   0.000     22.70283     23.7317
------------------------------------------------------------------------------
```

$Y = 23.21727 + 0.6879071 P_C + E_t$

Correlation Matrix

i. $Y = f(P_P, P_C, P_S)$

```
. corr lny lnpp lnps lnpc
(obs=26)

             |      lny     lnpp     lnps     lnpc
-------------+------------------------------------
         lny |   1.0000
        lnpp |   0.5740   1.0000
        lnps |   0.8069   0.8582   1.0000
        lnpc |   0.9461   0.4273   0.7384   1.0000
```

APPENDIX 2 Lag Selection Criteria

$\mathbf{Y = a_0 + a_2 P_C + E_t}$

varsoc y pc, maxlag(8)

Selection-order criteria
Sample: **1994 – 2011** Number of obs = **18**

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-497.877				4.5e+21	55.5418	55.5555	55.6408
1	-447.859	100.03	4	0.000	2.7e+19	50.4288	50.4698	50.7256
2	-442.174	11.372	4	0.023	2.3e+19	50.2415	50.3097	50.7362
3	-438.555	7.2382	4	0.124	2.6e+19	50.2838	50.3793	50.9764
4	-436.268	4.5739	4	0.334	3.5e+19	50.4742	50.597	51.3646
5	-433.786	4.9633	4	0.291	5.0e+19	50.6429	50.7929	51.7311
6	-422.565	22.443	4	0.000	3.2e+19	49.8405	50.0178	51.1266
7	-407.975	29.18*	4	0.000	2.0e+19	48.6639*	48.8685*	50.1478*
8	.	.	4	.	-9226.08*	.	.	.

Endogenous: y pc
Exogenous: _cons

$\mathbf{Y = a_3 + a_5 P_S + E_t}$

varsoc y ps, maxlag(8)

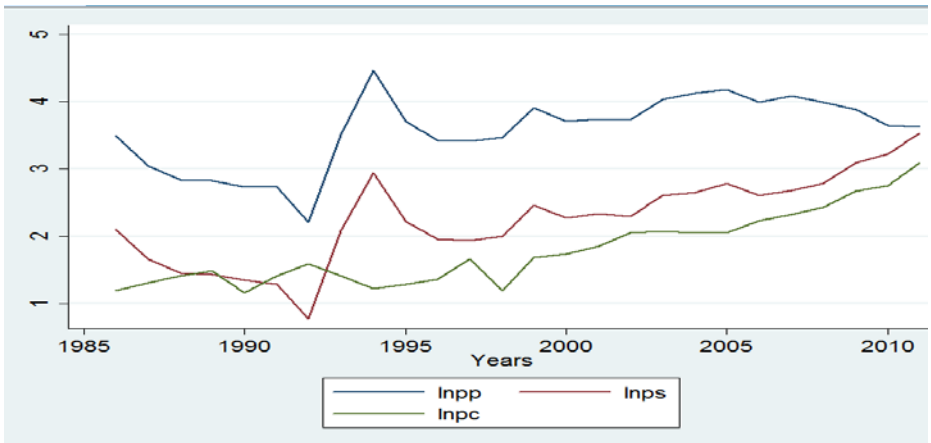
Selection-order criteria
Sample: **1994 – 2011** Number of obs = **18**

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-513.493				2.6e+22	57.277	57.2906	57.3759
1	-467.976	91.034	4	0.000	2.6e+20	52.6639	52.7049*	52.9607*
2	-465.042	5.8676	4	0.209	3.0e+20	52.7824	52.8506	53.2771
3	-462.575	4.9326	4	0.294	3.7e+20	52.9528	53.0483	53.6453
4	-458.724	7.7034	4	0.103	4.2e+20	52.9693	53.0921	53.8597
5	-457.943	1.5609	4	0.816	7.4e+20	53.327	53.4771	54.4153
6	-453.019	9.8493	4	0.043	9.6e+20	53.2243	53.4016	54.5104
7	-443.094	19.85*	4	0.001	1.0e+21	52.566*	52.7706	54.0499
8	.	.	4	.	-123954*	.	.	.

Endogenous: y ps
Exogenous: _cons

APPENDIX 3 Time Series Plot

PP, PS and PC (1986-2011)



APPENDIX 4 Unit Root Test (ADF)

Income (Y)				
Augmented Dickey-Fuller			No. of Observations = 22	
	T-Statistic	1% C.V.	5% C.V.	10%C.V.
Z(t)	2.212	-3.750	-3.000	-2.630
Mackinnon approximate p-value for Z9t) = 0.9989				

Petrol Subsidy (PS)				
Augmented Dickey-Fuller			No. of Observations = 22	
	T-Statistic	1% C.V.	5% C.V.	10%C.V.
Z(t)	1.054	-3.750	-3.000	-2.630
Mackinnon approximate p-value for Z9t) = 0.9948				

Petrol Consumption (PC)				
Augmented Dickey-Fuller			No. of Observations = 22	
	T-Statistic	1% C.V.	5% C.V.	10%C.V.
Z(t)	2.872	-3.750	-3.000	-2.630
Mackinnon approximate p-value for Z9t) = 1.0000				

APPENDIX 5 Johansen Cointegration Test

H0: There is no cointegration

Income (Y) against Petrol Consumption (PS)				
Johansen Cointegration Test			No. of Observations = 23,	
Max Rank	Parms	Eigenvalue	T-Statistic	5% C.V.
0	10	-	11.0451	15.41
1	13	0.38135	0.0000	3.76
2	14	0.00000		

Income (Y) against Petrol Subsidy (PS)				
Johansen Cointegration Test			No. of Observations = 23,	
Max Rank	Parms	Eigenvalue	T-Statistic	5% C.V.
0	10	-	5.4467	15.41
1	13	0.21086	0.0000	3.76
2	14	0.00000		

Petrol Consumption (PC) against Petrol Subsidy (PS)				
Johansen Cointegration Test			No. of Observations = 23,	
Max Rank	Parms	Eigenvalue	T-Statistic	5% C.V.
0	10	-	10.7389	15.41
1	13	0.26674	3.9134	3.76
2	14	0.16296		

APPENDIX 6 Granger Causality Test

Granger Causality of Income against Petrol Consumption

H0: All lag variables does not influence Y

Income (Y) against Petrol Consumption (PC)				
Granger (Wald) Test				
Equation	Excluded	Chi Squared	df	P>Chi2
Y	PC	6.3736-	3	0.095
Y	ALL	6.3736	3	0.095
PC	Y	-	0	-
PC	ALL	-	0	-

Granger Causality of Income against Petrol Subsidy

H0: All lag variables does not influence Y

Income (Y) against Petrol Subsidy (PS)				
Granger (Wald) Test				
Equation	Excluded	Chi Squared	df	P>Chi2
Y	PC	2.195	3	0.533
Y	ALL	2.195	3	0.533
PC	Y	2.3679	1	0.124
PC	ALL	2.3679	1	0.124

Granger Causality of Income against Petrol Subsidy

H_0: Petrol Subsidy can influence Petrol Consumption

Petrol Consumption (PC) against Petrol Subsidy (PS)				
Granger (Wald) Test				
Equation	Excluded	Chi Squared	df	P>Chi2
Y	PC	2.4438	3	0.486
Y	ALL	2.4438	3	0.486
PC	Y	32.305	3	0.000
PC	ALL	32.305	3	0.000

APPENDIX 7 Autocorrelation and Normal Distribution Test

H0: residuals are normally distributed

Y = f(PC)

```
. varlmar
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	1.3523	4	0.85245
2	2.1960	4	0.69976

H0: no autocorrelation at lag order

```
. varnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
y	60.371	2	0.00000
pc	0.541	2	0.76300
ALL	60.912	4	0.00000

Y = **f(PS)**

```
. varlmar
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	4.1412	4	0.38723
2	0.7368	4	0.94671

H0: no autocorrelation at lag order

```
. varnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
y	35.288	2	0.00000
ps	6.000	2	0.04979
ALL	41.288	4	0.00000

$P_C = f(P_S)$

varlmar

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	**2.1888**	**4**	**0.70109**
2	**2.6527**	**4**	**0.61752**

H0: no autocorrelation at lag order

varnorm, jbera

Jarque-Bera test

Equation	chi2	df	Prob > chi2
pc	**0.484**	**2**	**0.78490**
ps	**16.032**	**2**	**0.00033**
ALL	**16.516**	**4**	**0.00240**

APPENDIX 8: Stakeholder Analysis

S/NO	Stakeholders	Removal of Fuel Subsidy		Improved Capacity Utilization of Domestic Refineries	
		Position	Remark	Position	Remark
1.	Major Foreign Oil Producing Companies (Shell, Mobil, Chevron, Total E&P, NAOC/Phillips, Texaco, Pan-Ocean)	√	Would reduce local consumption and increase export to 'home' countries.	**X**	Would reduce export to 'home' countries.
2.	Foreign Nations (Major destinations of Oil Exportation): North America, Europe, Africa, South America and Asia	√	Would reduce local consumption and increase receivable crude oil.	**X**	Would reduce receivable crude oil.
3.	Foreign Nations (Major sources of fuel importation): Europe, Spain the Mediterranean, the Baltic, South Africa and West Africa (Ghana)	√	Would reduce their foreign earning from Nigeria, but would increase fuel availability in 'home' countries.	**X**	Would reduce demand from Nigeria - reduction of foreign earning from Nigeria.
4.	International Development Institutions (IMF and World bank)	√	Would reduce local consumption, increase availability of products in major funding countries.	**X**	Would reduce availability of products in the major funding countries.
5.	Major fuel importers: Mobil, NNPC Retail, Oando, Conoil, Total, African Petroleum and MRS Oil	**X**	Removal of subsidy would reduce their earnings.	**X**	Would reduce their earnings.
6.	Federal Government	√	Would increase disposable fund to other sectors/projects.	Δ	Would reduce expenditure on fuel subsidy but would adversely affect its relationship
7.	State Governments	√	May increase shareable fund from the federation account.	Δ	May increase shareable fund from the removal of subsidy.
8.	Civil servants and Corrupt elements in Government Agencies and Oil industry	**X**	Would reduce their earnings via rents, bribery, over-invoicing, theft or embezzlement.	√	Would reduce their earnings via rents, bribery or embezzlement.
9.	Distributors/Transporters/licensed Dealers of petroleum products	**X**	Would reduce their payback period and increase financial risk	**X**	Would reduce transportation risk since each would be dealing with the nearest refinery/depot, but reduce earning from PEF.
10.	Civil society Organizations/National Labour Congress	**X**	Would increase hardship for members, and they do not trust the government to use the fund that would be saved for the benefit of ordinary Nigerians.	√	Would reduce the cost of fuel and ejection of fund to improve the living standard of Nigerians. It would ensure availability of product.

Keys: **√=In favor X=Against Δ=Neutral.** Source: Centre for public policy alternatives, 2013

초 록

휘발유 보조금 폐지가 나이지리아 경제적 성과에 미치는 영향에 대한 계량 경제 분석

함자 알리우 다네지

협동과정 기술경영경제정책전공

서울대학교 대학원

나이지리아는질이좋은경질유자원을소유하며하루에2.5MMbbls 생산량이가진세계의원유수출국가(오펙멤버) 이다.원유는국가경제성장의대기부자이기도한다.남,북지역으로구성된나이지리아는 1억 7천만의인구를가지고있으며아프리카땅의대국중하나라고일컬을만하다.남부해안지역은 나이지리아의원유상품을산출하는곳이며수출터미널과정밀상품수입터미널도잘구비되어있다.나이지리아가원유를산출하지만국내수요에비해원유를정련하는능력이아직많이낮다는것은사실이다.

따라서정유수요의갭을메우기위해정유를수입할수없게되었다.결국, 균일한유가를유지하기위해정부가남부산지에서북방까지휘발유의운송비용에대한보조금을주기로하였다.동시에마케팅회사로수입한휘발유의가격은규정된가격보다훨씬비싸므로이가격차에대해서도보조금을주기로하였다.

원유 품질의 차의 증가에 따라 경유와 중유 상품의 가격갭도 심해진다. 석유 수출국가의 정부들이 세금수입의 포기금액은 약 전국의 석유수출액의 삼분의 일을 차지한다고 발표했다(Mark Cosmo, 1989). 그결과, 유가의상승에따라국가들이지원하는보상금액을올릴수밖에없고이정책을없애는데에도점점힘들어진다.

석유는 나이지리아 경제의 주요 기지국이다.(가장 귀중하고, 다용도하면서도 고갈 속도 빠른 비재생자원):

- 80년대부터 나이지리아의 외환수입의 97%차지

- 80년대에 국가 GDP 의 20%~25% 이상 차지하며 국가재정수입의 70% 차지

석유 보조금은 소비자들이 실제가보다 싼 시중가를 지불하여 휘발유 구매를 원하는 데에 존재한다. 1986 년 9 월에 효과가 보인 후에, 정부가 점차 보조금 정책을 철수하기로 하였다. 이 상황에도

불구하고, 대다수의 나이지리아 사람들은 하류 석유 생산 부분의 보조금 폐지를 외쳤다. 본 논문은 석유 보조금의 폐쇄로 인한 나이지리아 경제에 미치는 영향에 대한 분석을 하고, 석유 수요의 변화가 국가 GDP 을 미치는지도 분석하고자 한다.

본 논문은 다중 회귀계량경제법을 사용하여 수입은 유가와 유가 보조금, 그리고 경제성장에 긍정적인 영향을 미치는 소비량의함수로 삼아 경제 성장에 도움이 주는 석유 세금을 계산한다. 향후에는 시간에 따른 여러 가지 효과를 측정하기 위해 시계열분석방밥을 사용한 연구도 추가할 것이다.

다른 석유 산출국가의 성공적인 보조금 폐지 정책과의 비교를 통해 경제성과도 높일 수가 있다. 기타 석유 대체 자원에 대한 연구 정책은 경제 성장의 제고 효과가 있다. 뿐만 아니라 자원 방비에 대한 최소화 효과와 편의성으로 인한 탄소 배출도 효과가 있다. 결국 절약한 석유 자원은 미래에 증가된 수요에 만족시킬 수 있게 된다.

요약어: *나이지리아, 휘발유보조금, 계량경제학, 시계열분석, 영향, 경제성과*

학 번: 2012-22604